# ENVIRONMENTAL SUSTAINABILITY and HOG PRODUCTION in MANITOBA

DECEMBER 2007

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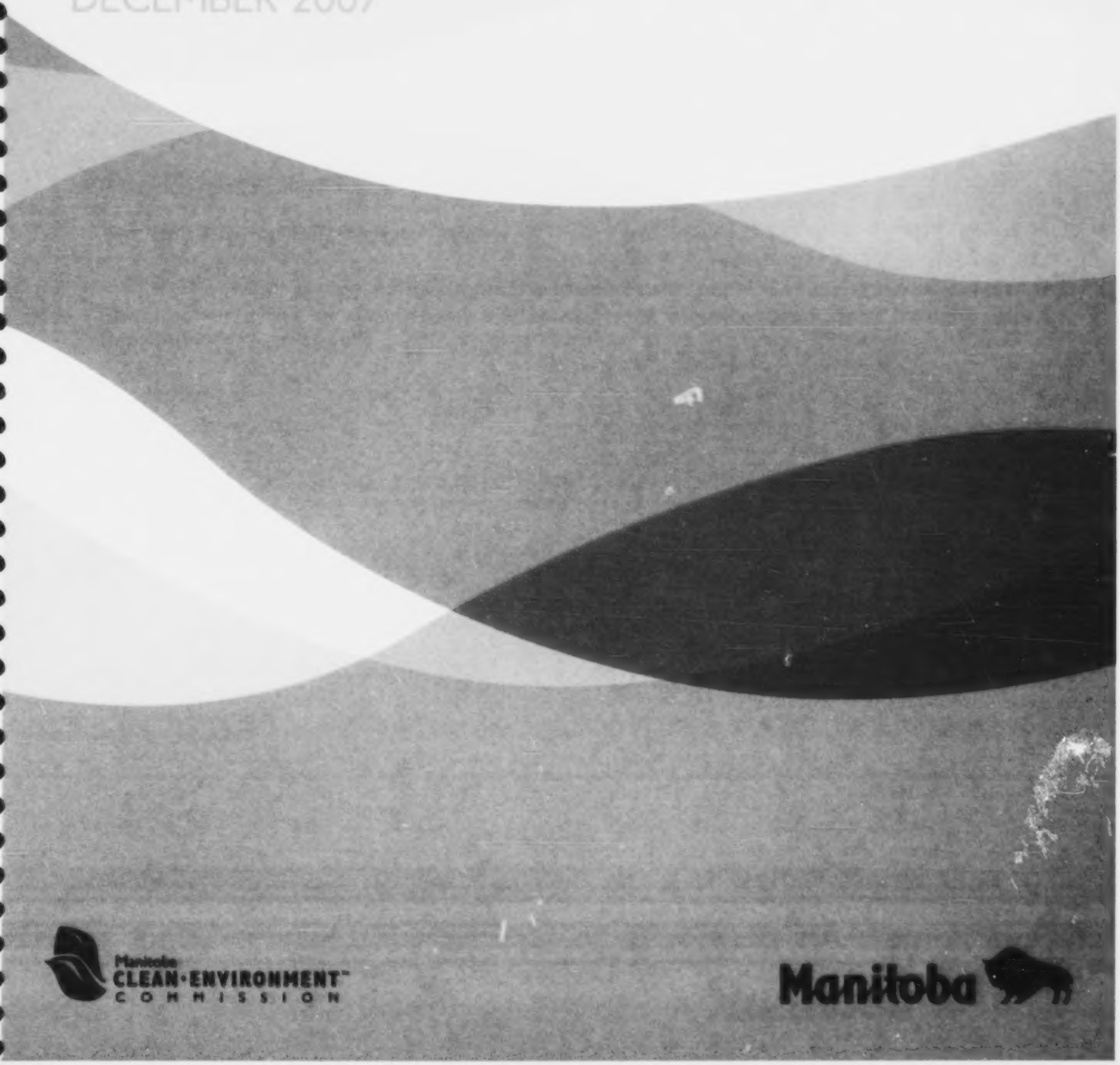

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December 18, 2007

Honourable Stan Struthers
Minister of Conservation
Room 330 Legislative Building
450 Broadway
Winnipeg, Manitoba R3C 0V8

Dear Minister Struthers:

**Re: Hog Production Industry Review**

The Panel is pleased to submit the Clean Environment Commission's report on the review of the environmental sustainability of the hog production industry in Manitoba.

Sincerely,

Terry Sargeant, Chair

W. Motheral

Wayne Motheral

Edwin Yee

Edwin Yee

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# Foreword

Just over a year ago – in the fall of 2006, the Clean Environment Commission was asked to determine whether or not the production of hogs, as it has developed in Manitoba, is environmentally sustainable.

The simple answer is: "Yes, but …."

The not-so-simple answer unfolds on the pages of this report. In short, if the hog production industry continues to grow, it will not remain environmentally sustainable unless significant resources are dedicated to addressing the many associated environmental issues. Such resources would include staff to conduct the approvals process, to monitor compliance with the regulatory regime, and to conduct the research necessary to ground environmental regulations.

In carrying out this assignment, the Commission conducted a comprehensive investigation. In a total of 20 public meetings, we heard from hundreds of Manitobans, who represented opinions on all sides of all of the many issues related to agricultural sustainability. We met with representatives of many organizations - environmental, agricultural, and municipal, among others. And, we read extensively: reports commissioned by us for this investigation; written submissions provided by private citizens and industry supporters;

and a wide range of literature given us by interveners.

While we are of the view that our investigation was thorough, we recognize that our report is certainly far from the final word on this matter. Still, we do believe that the recommendations we make, when implemented, will go a long way towards ensuring that hog production in Manitoba is environmentally sustainable.

We were not asked to look at the economic sustainability of hog production. But, it is impossible not to have noted that the industry is currently at a proverbial cross-road. Although this is true of the industry worldwide, Manitoba has its own unique elements.

Manitoba hog producers face a number of challenges that were not even on the horizon a couple of years ago. These include: the rapid rise in the value of the Canadian dollar; the large increase in the cost of feed, in no small part driven by the rapid expansion of ethanol production; proposed U. S. federal legislation, which will act as a trade barrier; and the closure of a number of meat-packing plants across Canada.

It was in this context that the Clean Environment Commission set out to review the environmental sustainability of raising pigs in Manitoba.

The environmental challenges that face the industry are thoroughly canvassed in the ensuing pages of our report. In the end, we make a number of recommendations as to how these challenges can be met and managed.

It is the overriding view of the Commission that these environmental issues cannot be properly managed in a vacuum and that environmental regulation must be scientifically-based. To these ends, the government must compile a comprehensive database of information in respect of hog production in the province. (We were surprised to discover that no one – the government, the Manitoba Pork Council, individual municipalities – is able to identify all of the hog operations in the province.)

And, the government must facilitate research into a number of matters that may threaten environmental sustainability. Over the past dozen or so years, the hog industry has expanded more quickly than scientific research. While much of this gap has been closed in recent years, the capacity must be enhanced to allow research to get out in front of any future growth in the industry.

In this regard, we recommend that a Watershed Studies Institute be established to co-ordinate and facilitate research into the many environmental issues that may impact on watersheds. We see this as being a key element of the province's water strategy, and also one that would contribute significantly to the environmental sustainability of livestock production.

We were asked by a number of parties to recommend that new hog operations be required to go through a full environmental assessment. We stopped short of doing that, opting for a new process that would be somewhat more stringent than the current Technical Review process, but not as demanding as the environmental assessment process.

It is also the view of the Commission that, given what we know today about the industry, there is no further excuse for haphazard growth of the industry, which particularly marked the early years of the rapid expansion seen after 1994. The ensuing years have seen the implementation of the first Livestock Manure and Mortalities Management Regulation in 1998, the report of the Livestock Stewardship Initiative, *On Common Ground*, in 2000, the report of the Department of Conservation's review of the sustainability of hog production, in 2006 and, now, the CEC report. The Commission concludes that all of these endeavours provide a solid base for well-planned future expansion.

The Clean Environment Commission has, in the past, indicated its strong support for the Province of Manitoba's water strategy, noting that Manitobans are in the enviable position of having one of the world's best supplies of fresh water. We have further noted that, too often, Manitobans seem to take our fresh water for granted, without worrying about future users.

The CEC sees this investigation as a significant element of the province's water strategy and, ultimately, its environmental strategy. While we did not focus our investigation on Lake Winnipeg, we were always cognizant that most of the surface water in Manitoba ultimately flows through that lake.

In this regard, many producers pointed out that, while there have been major strides to regulate hog farmers in recent years, there has been little or no progress on the part of the City of Winnipeg to reduce its nutrient loading into the lake. Add to that the growth in the number of cottages around Manitoba lakes with what many perceive to be inadequate sewage management. This has led to a widespread belief among hog producers that they are forced to bear an unfair burden for addressing Lake Winnipeg concerns.

We were cautioned that additional, stringent regulation could threaten the economic sustainability of hog production in Manitoba. This raised the question as to whether we subsidize the industry by weakening environmental regulation or by other means. To this end, the Commission supports the stated intentions of the government to provide assistance for farmers in adapting to the new regulations.

While we did hear from many Manitobans with environmental and social concerns about the hog industry and its evolution over the past decade and a half, we also heard many positive stories. We heard that, in some communities, hog farming has created a number of jobs, which, in turn, has helped keep young families in the communities. We heard that one town was even able to re-open a school. And, we were told about the many businesses that had come into being to support the industry.

The Commission became very aware, through the investigation, that an inevitable conflict arises within government when it has the roles of both promoting and regulating an industry. We noted, as well, that there is too often a lack of cooperation between departments which play interdependent roles in the regulation of the industry. This was underlined in the Auditor General's recent report on industry regulation. It is the view of the Commission that government would be well-advised to consider ways in which it can address such matters.

Many of our recommendations address current issues and can, and should, be implemented immediately. This would provide an immediate start to maintaining environmental sustainability. Other recommendations are longer term. While less urgent, they are equally important in achieving long-term environmental sustainability.

## Acknowledgments

There was a huge number of people involved throughout the many months of our investigation, from Commission staff to the hundreds of Manitobans who expressed their views or shared their experiences and expertise.

Above all, I would like to acknowledge the contribution of those closest to the centre of the Investigation. They include my co-panelists: during the initial, scoping meetings, Norm Brandson and Wayne Motheral; and in the main course of meetings, Wayne Motheral and Edwin Yee. I would also like to thank Commission staff members, Cathy Johnson and Joyce Mueller for their skills and dedication. And a special thanks to our report writer, Doug Smith, who also undertook an amazing amount of research. All of the foregoing contributed a huge effort in this investigation.

We received considerable support from a number of consultants, engaged by the

Commission to help us understand the many, complex issues surrounding our work. A number of individuals also gave of their time to share their expertise and experiences in matters related to the review.

We could not have carried out our investigation without the great assistance of many officials in a number of provincial government departments, including: Agriculture, Food and Rural Initiatives; Conservation; Intergovernmental Affairs; and Water Stewardship. These folks patiently explained their programs' role in the development and regulation of the hog industry in Manitoba, as well as responding to our seemingly unending requests for information.

Terry Sargeant, Chair

December 2007

# Executive summary

In November 2006, the Manitoba Minister of Conservation made a request to the Clean Environment Commission (the Commission) that it conduct an investigation into the environmental sustainability of hog production in Manitoba. The Commission was tasked with assessing current environmental regulations to determine their effectiveness for the purpose of managing hog production in an environmentally sustainable manner.

In conducting this Investigation, the Commission held 20 public meetings in agricultural Manitoba during the winter and spring of 2007, reviewed an extensive range of literature, commissioned original reports, and consulted with academics, federal, provincial and municipal officials.

Based on *The Sustainable Development Act*, the Commission concluded that an assessment of the environmental sustainability of the hog-production industry involved determining if that industry can be maintained indefinitely in light of its impact on air, land, water, flora, and fauna.

The first section of this report (Chapter 1-8) surveys the environmental sustainability issues associated with hog production, provides an overview of the evolution of the industry and current practices in Manitoba, outlines the measures taken to regulate the industry in Manitoba, and summarizes the presentations made to the Commission by the public. The second section (Chapter 9-13) presents the Commission's findings and recommendations.

The Commission recognizes that the regional imbalances that have developed between the application and removal of nutrients and the potential impact of these nutrients on water resources constitute the most serious environmental sustainability issues facing the industry. It is recommending that the phase-in dates for the Livestock Manure and Mortalities Management Regulation phosphorus (LMMMR) provisions be adjusted so that all operators are required to be fully compliant with the LMMMR by 2013. The Commission also is calling for a complete ban on the winter application of manure by 2013, a review of the phosphorus provisions of the LMMMR within five years, and the provision of financial assistance or incentives to livestock operators as they adjust to the new regulation. In its discussion of water-related issues in this report, the Commission addresses the following issues:

- The shortcomings of the current science in identifying soil phosphorus threshold levels specific to Manitoba.
- The land base to which new and expanding operators must have access.
- The time of application of manure.
- The impact of application on marginal land.
- The Nutrient Management Regulation.
- Pathogens and heavy metals in manure.
- The design approval, construction, and monitoring of manure-storage facilities.
- Compliance and enforcement of the LMMMR.
- Water supply issues.

The Commission is recommending, in response to both climate-change and odour issues, that all new and expanding manure-storage facilities have synthetic covers and that operators be required to either inject or incorporate manure within 48 hours of application to fields. The Commission also addresses:

- The Farm Practices Protection Board.
- The establishment of a dispersion-theory-based farm odour guideline.
- Research into a range of odour-related issues.

The Commission recognizes that while land (soils) and flora and fauna (biodiversity) issues do not present a current barrier to the industry's ecological sustainability, these issues need continued research and monitoring. It is making recommendations in relation to the following issues:

- Inclusion of biodiversity conservation considerations into the decision-making process.
- Identification of ecologically sensitive sites.
- Workplace safety and health in hog-production facilities.
- Preparation for animal disease outbreaks.
- The use of antibiotics in raising livestock.

The current approval process needs to be strengthened with the ultimate goal of having decision-making take place in a watershed-management context. The Commission is recommending that this be done through the inclusion of a site assessment early in the process and broadening the range of issues that are considered in the approval process. Manitoba Conservation would serve as the lead agency in this new process.

The Commission also recognizes that there is a need for improvement in the availability of information and communication with producers and the public. It is calling on the government to improve data collection and research, as well as to establish a Watershed Studies Institute.

This report is an evaluation of the environmental sustainability of the hog-production industry. The Commission is well aware of the fact that some of its recommendations will have economic impacts for producers. While much of the focus in this report is on regulation and enforcement, there is an equal, if not more important, role to be played by those who work for the government doing agriculture extension work, environmental farm planning, and in developing programs that reward farmers for providing environmental farm services.

Environmental sustainability is achievable, but it cannot be put off into the future. The challenge for the government will be to develop an implementation strategy that works with producers and other members of society to ensure the industry's social and economic sustainability. In those areas where nutrient production is currently out of balance with the environment's ability to remove those nutrients, the province and producers must move quickly and cooperatively to bring production into balance within the next five years.

# Résumé

En novembre 2006, le ministre de la Conservation du Manitoba a demandé à la Commission de protection de l'environnement de mener une enquête sur la durabilité de la production porcine au Manitoba du point de vue de l'environnement. La Commission a été chargée d'évaluer la réglementation actuelle en matière de protection de l'environnement afin de savoir si elle permet effectivement une gestion responsable de la production porcine sur le plan environnemental.

Dans le cadre de cette enquête, la Commission a organisé 20 réunions publiques dans des régions rurales du Manitoba pendant l'hiver et le printemps 2007, elle a examiné une grande quantité de documents, elle a commandé des rapports originaux et elle a consulté des universitaires et des représentants fédéraux, provinciaux et municipaux.

En se basant sur la *Loi sur le développement durable*, la Commission a conclu que l'évaluation de la durabilité de la production porcine du point de vue de l'environnement consistait à déterminer si cette industrie pouvait être maintenue indéfiniment si l'on tenait compte de ses répercussions sur l'air, la terre, l'eau, la flore et la faune.

La première partie de ce rapport (chapitres 1 à 8) étudie les problèmes environnementaux liés à la production porcine, fournit une vue d'ensemble de l'évolution de l'industrie, décrit les pratiques actuelles au Manitoba, met en relief les mesures prises pour réglementer l'industrie au Manitoba et résume les présentations faites à la Commission par le public. La deuxième partie de ce rapport (chapitres 9 à 13) présente les résultats et les recommandations de la Commission.

La Commission reconnaît que le déséquilibre régional qui s'est créé entre l'application de nutriants et leur élimination, avec les conséquences potentielles que ces nutriants peuvent avoir sur les ressources en eau, constitue le plus grave problème auquel l'industrie porcine est confrontée d'un point de vue environnemental. Il est recommandé que les dates de mise en place progressive des dispositions relatives au phosphore du *Règlement sur la gestion des animaux morts et des déjections du bétail* soient ajustées afin que le plein respect de ce règlement, par tous les exploitants, soit atteint en 2013. La Commission préconise aussi une interdiction absolue d'épandre des déjections en hiver d'ici 2013, une révision des dispositions relatives au phosphore du *Règlement sur la gestion des animaux morts et des déjections du bétail* d'ici cinq ans et la mise en place d'une aide financière ou de mesures incitatives pour les éleveurs de bétails afin de leur permettre de s'adapter à la nouvelle réglementation. Dans le cadre des questions relatives à l'eau abordées dans ce rapport, la Commission se penche sur les points suivants :

- les insuffisances de la science actuelle à déterminer, pour le Manitoba, les niveaux limites de phosphore dans le sol;
- les terres auxquelles les nouveaux exploitants et ceux qui s'agrandissent doivent avoir accès;
- le moment auquel s'effectue l'épandage de déjections;
- les conséquences d'un épandage sur des terres marginales;
- le *Règlement sur la gestion des nutriants;*
- les pathogènes et les métaux lourds dans les déjections;
- l'approbation de la conception, la construction et la gestion des installations de stockage des déjections du bétail;
- le respect et la mise en application du *Règlement sur la gestion des animaux morts et des déjections du bétail;*
- des questions d'approvisionnement en eau.

La Commission recommande, en réponse aux changements climatiques et aux problèmes d'odeur, que toutes les nouvelles installations de stockage des déjections du bétail et que toutes celles devant être agrandies soient recouvertes d'une matière synthétique et que tous les exploitants soient tenus d'injecter les déjections du bétail ou de les incorporer dans les sols dans les 48 heures après l'épandage. La Commission se penche aussi sur :

- la Commission de protection des pratiques agricoles;
- la mise en place d'une ligne directrice sur les odeurs basée sur une théorie de la dispersion des odeurs pour les exploitations agricoles;
- la recherche portant sur diverses questions liées aux odeurs.

La Commission reconnaît que bien que les questions relatives à la terre (aux sols) et à la flore et à la faune (à la biodiversité) ne limitent pas actuellement la durabilité de l'industrie du point de vue de l'environnement, ces questions doivent faire l'objet de recherches et d'un suivi continus. Elle propose des recommandations relativement aux questions suivantes :

- l'inclusion de considérations relatives à la conservation de la biodiversité dans le processus de prise de décision;
- la détermination de sites écosensibles;
- la sécurité et l'hygiène du travail dans les entreprises de production porcine;
- la préparation aux épidémies animales;
- l'utilisation d'antibiotiques dans l'élevage du bétail.

Le processus actuel d'approbation doit être renforcé avec pour objectif ultime la prise de décision dans un contexte de gestion de bassins hydrologiques. La Commission recommande que cela soit fait en incluant une évaluation du site en début de processus et en élargissant l'éventail de questions envisagées lors du processus d'approbation. Conservation Manitoba serait l'organisme chef de file dans ce nouveau processus.

La Commission reconnaît également qu'il y a des progrès à faire relativement à la disponibilité de l'information et à la communication avec les producteurs et le public. Elle demande au gouvernement d'améliorer la collecte de données et la recherche et de mettre en place un institut de recherche sur les bassins hydrologiques.

Ce rapport est une évaluation de la durabilité de la production porcine du point de vue environnemental. La Commission est tout à fait consciente du fait que certaines de ses recommandations auront des conséquences économiques pour les producteurs. Bien que ce rapport insiste beaucoup sur la réglementation et la mise en application de cette dernière, il indique que les personnes qui travaillent pour le gouvernement dans le domaine de la vulgarisation agricole ou de la planification environnementale à la ferme ou qui participent à l'élaboration de programmes qui récompensent les agriculteurs pour leurs pratiques agricoles écologiques ont un rôle d'importance égale, si ce n'est supérieure, à jouer.

La durabilité de l'environnement est un objectif qu'il est possible d'atteindre, mais il ne faut pas remettre cette tâche à demain. Le défi pour le gouvernement sera de concevoir une stratégie de mise en œuvre qui soit acceptable pour les producteurs et les autres membres de la société et qui permette d'assurer la viabilité sociale et économique de l'industrie. Dans les régions où la production de nutriants est actuellement en déséquilibre par rapport à la capacité d'élimination de l'environnement, la Province et les producteurs doivent agir rapidement et en collaboration pour rétablir l'équilibre d'ici les cinq prochaines années.

# 1 Introduction

## 1.1 Mandate and terms of reference

In November 2006, in accordance with section 6(5)(a), (b), and (c) of *The Environment Act*, the Manitoba Minister of Conservation made a request to the Clean Environment Commission (the Commission) that it conduct an investigation into the environmental sustainability of hog production in Manitoba. The request included the following terms of reference.

1. The CEC, as a part of its investigation will review the current environmental protection measures now in place relating to hog production in Manitoba in order to determine their effectiveness for the purpose of managing hog production in an environmentally sustainable manner.
2. The CEC investigation must include a public component to gain advice and feedback from Manitobans. This public component should be conducted by means of public meetings in the various regions of Manitoba to ensure broad participation from the general public and affected stakeholders.
3. The CEC investigation should include a review of the contents of the report prepared by Manitoba Conservation entitled *An Examination of the Environmental Sustainability of the Hog Industry in Manitoba*.

4. The CEC will, as part of this investigation, take into account the efforts underway in other jurisdictions to manage hog production in a sustainable manner.

5. As part of its investigation, and based on public feedback, the commission will consider various options and make recommendations in a report to the Minister on any improvements that may be necessary to provide for the environmental sustainability of hog production in Manitoba.

At the same time the Manitoba government amended the Livestock Manure and Mortalities Managements Regulation to "temporarily restrict the further growth of pig agricultural operations" until the Commission completed its review.

## 1.2 The investigation

To fulfill these terms of reference the Commission struck two panels. The first panel, consisting of Norman Brandson, Wayne Motheral, and Terry Sargeant (Chair), held three days of public scoping meetings in January 2007. The second panel, consisting of Wayne Motheral, Terry Sargeant (Chair), and Edwin Yee, carried out the Investigation. As a part of its work, the second panel:

- Reviewed previous government reports and all pertinent legislation and regulations.
- Held 17 days of public meetings throughout agricultural Manitoba.
- Received 50 written submissions.
- Commissioned research papers that have been made available to the public on the CEC website throughout the Investigation.
- Visited a number of hog operations in southern Manitoba.
- Reviewed a wide range of publications and reports relating to livestock and sustainable agriculture.
- Consulted with a range of experts, including academics and federal, provincial, and municipal government officials.

## 1.3 The Report

Based on the above, the Commission has reached the conclusions and recommendations presented in this Report. The Report is divided into two sections. The chapters in the first section:

- Outline the principles of sustainable development as they relate to agriculture and discuss the barriers to the environmental sustainability facing the hog-production industry.
- Review the history and state of the hog-production industry in Manitoba.
- Outline the regulations that the Manitoba government has put in place to govern hog production in Manitoba and place these regulations in an international context.
- Summarize the presentations and submissions made at the public meetings that the Commission held in the spring of 2007.

The second section of the report provides a discussion of the key issues associated with the environmental sustainability of the industry, the Commission's conclusions, and recommendations on those various issues.

The appendices of the report include the principles and guidelines of sustainable development found in *The Sustainable Development Act,* the guide to public participation in the process (which includes the location of the public meetings that the Commission held), and a listing of individuals who made oral and written presentations to the Commission.

# 2 Environmental sustainability and the hog-production industry

The Commission has been mandated to conduct an "investigation into the environmental sustainability of hog production in Manitoba." Such an investigation is not possible without a clear definition of environmental sustainability and an understanding of the sustainability of the hog-production sector in particular. This chapter develops a definition of environmental sustainability based on Manitoba's *Sustainable Development Act* and then outlines the potential barriers to sustainability facing the hog-production sector.

## 2.1 Environmental sustainability

A key document for interpreting the mandate provided to the Commission for this Investigation is *The Sustainable Development Act*. The Act was intended to implement sustainable development in the provincial public sector and promote it in the provincial private sector. It defines the environment as being inclusive of the "air, land, water, flora and fauna," distinguishing it from the economy, which it defines as the "global system of managing resources and of producing, distributing and consuming goods and services." Sustainability is defined as the "capacity of a thing, action, activity or process to be maintained indefinitely in a manner consistent with the spirit of the Principles and Guidelines" of *The Sustainable Development Act*. Sustainable development is defined as development that meets "the needs of the present without compromising the ability of future generations to meet their own needs."

The Principles and Guidelines for Sustainable Development appear in full in Appendix 1 of this report. In summary, the principles call for:

- An integration of environmental and economic decisions.
- The need to make development decisions in light of the needs of current and future generations.
- The role of shared responsibility and understanding in decision making.
- The need to anticipate, and prevent or mitigate, significant adverse effects of decisions and actions.
- The importance of conserving and enhancing natural eco-systems and other ecological resources.
- The importance of efforts to rehabilitate damaged resources and to include rehabilitation and reclamation measures in future decisions.
- The need to recognize a global interdependence and integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.

The sustainable development guidelines call for:

- Efficient use of resources, including the use of full-cost accounting to provide better information for decision makers. Full-cost accounting is defined as accounting for the economic, environmental, land use, human health, social and heritage costs and benefits of a particular decision or action to ensure no costs associated with the decision or action, including externalized costs, are left unaccounted for.
- Public participation, including forums for meaningful participation in decision making, due process, and a commitment to consensus.
- Access to information, which includes equal and timely access by all Manitobans to economic, environmental, human health, and social information.
- Decision-making and planning processes that are efficient, timely, accountable, and cross-sectoral and incorporate an inter-generational perspective.
- Waste minimization and substitution.
- The researching, development, application, and sharing of knowledge and technologies which further our economic, environmental, human health, and social well-being.

Based on the language of *The Sustainable Development Act*, the Commission concluded that in assessing the environmental sustainability of the hog-production industry it is assessing if that industry can be maintained indefinitely in light of its impact on air, land, water, flora and fauna. The Commission is in agreement with a recent Quebec government investigation into the hog industry that concluded that the "industry will be ecologically sustainable to the extent that it is able to coexist with the natural environment while maintaining the productivity, diversity, quality, and carrying capacity of that environment" (Bureau d'audiences publiques sur l'environnement 2003, 37).

Agriculture and Agri-Food Canada has adopted the following definition of sustainable agriculture:

> Sustainable agriculture protects the natural resource base, prevents the degradation of soil, water, and air quality,

> and conserves biodiversity; contributes to the economic and social well-being of all Canadians; ensures a safe and high-quality supply of agricultural products; and safeguards the livelihood and well-being of agricultural and agri-foodworkers and their families. (Agriculture and Agri-Food Canada 2001, iii)

The Commission recognizes the mandate for this investigation, namely to focus on environmental sustainability, could be seen as being at odds with *The Sustainable Development Act*'s emphasis on integrating economic, environmental, human health, and social factors in decision-making. In the Guide prepared for participation in the hearing process, the Commission noted that while "the focus of this investigation will be on the impact that hog production has on the sustainability of the Manitoba environment, the Commission will integrate economic, human-health, and social factors in its analysis and recommendations." (The Guide is included in this report as Appendix 2.) While this report does consider those factors in its analysis and recommendations to the extent that those factors interact with the environmental questions under review, the Commission wishes to be clear that this Investigation has not extensively examined the full range of issues that The Sustainable Development Act envisions as being part of an assessment of sustainable development.

## 2.2 Agriculture, livestock production, and sustainable development

Farmers manage the earth's most productive lands: their activities provide most of the food needed to sustain the world's population of six-billion people. They are also expected to be the stewards of the soil, not only meeting current food and fibre needs, but ensuring that the earth's agricultural resources remain capable of feeding future generations. The demands of the future will be exacting: in the next half century the world population is expected to increase by fifty per cent. Farmers must also make a living and for many producers commodity prices are stagnant or in decline (Smil 2000; Tilman et al. 2002).

Not only are producers under an intense pressure to increase production to meet the needs of a growing population, they are under pressure to shift a dramatically increasing portion of their production to livestock as the growth of a global middle class and urbanization drive up the demand for meat. From 1980 to 2002, per capita consumption of meat doubled in developing countries and the total meat supply tripled. It is expected that in the next half century, the demand for meat will double (Steinfeld et al. 2006).

Meeting that demand will test agriculture's environmental sustainability. More specifically, it will test the environmental sustainability of the industrial agriculture revolution. Traditional agricultural practices survived for millennia; they met sustainability's test of time and continue to provide food and fibre for much of the world's population. But these practices have been challenged throughout much of the world, particularly since the end of the Second World War, by production methods that are far more intensive and industrialized. In industrialized nations such as Canada, these methods constitute the dominant form of agricultural production. Industrial agriculture is powered by non-renewable resources and specializes in a series of monocultures that are often produced for export markets. These changes have allowed farmers to feed a dramatically increased and increasing world population (Smil 2000).

The great challenge facing contemporary agriculture and human society as a whole is whether the coming increase in demand for food, in general, and meat, in particular, can be met by a system that is essentially working with finite resources (particularly in terms of land base) without compromising the environment or public health. The issues before this Investigation are numerous and complex, but they must be viewed in the context of this global challenge (Gibbon et al. 1995; Steinfeld et al. 2006; Tillman et al. 2002).

The sustainability of intensive, industrialized livestock production is central to this challenge. The intensification of livestock production, which currently provides one-third of humanity's protein intake, is a global phenomenon. By 2005, 40 per cent of the world's supply of pork came from intensive production. It is expected that all future growth in livestock production will be on an intensive basis (Naylor et al. 2005). A key element in this intensification has been dramatic increase in the number of animals that are raised in confined, enclosed locations where they feed on grains. The dramatic rise in this method of production has been driven by:

- Declining feed grains prices coupled with improved irrigation and feed technologies that allow for increased feed production. Livestock currently eat one third of the world's cereal harvest.
- Improved feed-to-meat conversion efficiencies.
- Improved animal health and reproduction rates.
- Low-cost transportation.
- Trade liberalization.
- The development of information technologies that allow for the management of global trade in livestock products (Naylor et al. 2005; Steinfeld et al. 2006).

There has also been a shift away from ruminants such as cows and sheep to monogastric animals such as pigs and poultry. Throughout the world, the livestock sector is the most rapidly growing agricultural sector, although in developed countries livestock growth rates peaked in the 1990s. Developing countries now produce more meat than developed countries (Steinfeld et al. 2006).

The dramatic growth of the livestock sector has not been without environmental consequences. A recent Food and Agriculture Organization (FAO) report described the livestock sector "as one of the top two or three most significant contributors to the most serious environmental problems, at every scale from local to global" (Steinfeld et al. 2006, xx). While the Manitoba hog industry may feel that it has been singled out, in reality, the intensive livestock sector is one that has been undergoing continuing environmental scrutiny throughout the world.

Concerns about the environmental sustainability of agriculture in Western Canada date back at least as far as the nineteenth century debate as to whether the Palliser Triangle was suitable for agriculture. The boom in immigration in the first decade of the twentieth century saw millions of acres of land of varying quality brought under cultivation. Prolonged drought and the collapse of grain prices in the 1930s dramatically demonstrated the environmental and economic weaknesses of the type of agriculture that had evolved in the prairies in the early twentieth century as over a quarter of a million prairie residents abandoned their farms (Tyrcheniewicz and Wilson 1995). In the wake of this disaster, the federal government established the Prairie Farm Rehabilitation Administration, whose mission in large measure, according to economic historian Vernon Fowke, involved "correcting the mistakes of the homestead era" (Fowke 1957, 286). Each generation of Manitoba farmers has become increasingly more aware of the complexity of the relationship between their enterprises and the environment. Many of the producers who appeared before the Commission spoke of how much more environmentally aware they are in their farming practices compared to their grandparents, who often, in the words of the presenters, had been unconsciously "mining the soil" of nutrients. In short, both globally and locally, environmental sustainability is not a single practice but a concept that guides continued change and adaptation.

## 2.3 Agriculture and the environment

The FAO study on livestock identified three major pathways through which agriculture affects the global environment:

- The conversion of natural ecosystems to agricultural land.
- The movement of nutrients from agricultural land to aquatic and terrestrial habitats and groundwater.
- The movement of pesticides from agricultural land to aquatic and terrestrial habitats and groundwater (Steinfeld et al. 2006; Tilman et al. 2002).

Beyond these three broad pathways, intensive livestock operations, and hog operations in particular, are associated with a number of specific environmental issues. These can be grouped under the following headings:

- Water quality and quantity (this can include water contamination and eutrophication due to the presence of excess levels of nutrients, pathogens, and reductions in water supply).
- Air quality (including greenhouse-gas emissions and odours).
- Changes in land use and soil degradation (including excess concentrations of nutrients and heavy metals).
- Biodiversity (including the impact of expanding cropland for growing feed and manure spreading on the habitats of other species).
- Health impacts (including the human health impacts of the on-farm use of antibiotics and workplace health and safety issues) (Naylor et al. 2005; Smil 2000; Steinfeld et al. 2006; Wilson and Tyrchniewicz 1995).

As this listing makes clear, environmental sustainability and stewardship involve far more than land use and water use practices. It should also be clear that these are issues for society at large, not simply for producers, and the responsibility for resolving them lies with society, not solely with individual producers. While many producers are poorly rewarded for the food they produce, they receive even less for implementing practices that sustain the environment and maintain and enhance ecological goods and services. It needs to be recognized that many of the environmental issues associated with intensive livestock production either do not directly affect producers (since their impacts are felt downstream) or may not be felt within the short to medium term. Unlike most industries, agriculture is a non-point, as opposed to a point, producer of potential contaminants: the runoff from fields does not flow through a pipe whose output can be monitored and measured. The chemical processes that take place in the soil are complex and not fully predictable. While it may be necessary to regulate individual producers, meaningful resolution of the environmental issues facing the hog-production industry must take place at the regional level (Gibbon et al. 1995; Tilman et al. 2002). The Commission also recognizes that many of the issues under consideration in this report are not unique to hog production and that the recommendations that it is making have implications for the broader livestock sector, agriculture, and the broader society.

There is also no single road to environmental sustainability. Arguments have been made that agricultural pressures on the land could be reduced by policies that sought to decrease rather than increase meat consumption or move away from intensive production methods that are dependent on non-renewable resources. The Commission recognizes that these arguments are not without their merits: however, the focus of this Investigation is an examination of the environmental sustainability of the existing hog-production sector in Manitoba.

# 3 Agriculture and the Manitoba economy

While this Investigation is not examining the economic and social sustainability of the hog-production industry, the Commission recognizes that it is necessary to place the industry in an economic and social context. The next three chapters of the report focus on different dimensions of that context: the contribution of agriculture to the Manitoba economy, the revolution in production methods in the North American hog industry, and finally the current state of the hog industry in Manitoba.

## 3.1 Farm population trends

From 1971 to 2000, the number of people living on Manitoba farms fell from 13 per cent (131,000 people) of the Manitoba population to 7 per cent (79,840 people) of the provincial population. While there is no current figure for the number of people living on farms, the number of farm operators in Manitoba is 26,625, a decline of 7.5 percent from 2001 (MAFRI).

Throughout the course of this Investigation a great deal of information was provided to the Commission by various Manitoba government departments and agencies, in particular, Manitoba Agriculture, Food and Rural Initiatives, Manitoba

Conservation, and Manitoba Water Stewardship. When unpublished material from these departments is provided, it will simply be cited by department name. These citations do not refer to any of the publications listed in the references at the end of this report.

## 3.2 Structure of farms

In 1996, 60 per cent of farms were sole proprietorship operations, compared with 57 per cent in 2006. In 1996, 64 percent of farmland was operator-owned and 36 per cent was rented by the operator, whereas in 2006, 61.2 per cent was operator-owned and 38.8 per cent was rented by the operator.

As Tables 3.1 and 3.2 demonstrate, there has been a significant decline in the number of young farmers over the decade and a similar increase in the role that off-farm income plays in farm economics. Just over 10 per cent of Manitoba farm operators are under 35 and off-farm income now accounts for close to seventy per cent of farm family total income.

**Table 3.1: Farm operator age demographics.**

| | 1996 | 2006 |
|---|---|---|
| **Aged less than 35** | 18 | 10.7 |
| 35-54 | 51 | 50.9 |
| **55+** | 31 | 38.4 |

*Source: 1996 and 2006 Census of Agriculture, MAFRI.*

**Table 3.2: Off-farm income**

| | 1996 | 2004 | 2005 |
|---|---|---|---|
| **Some off-farm income** | 30 | -- | 47.7 |
| Per cent of total family income came from off-farm sources | 43 | 69.4 | -- |

*Source: 1996 Census of Agriculture, MAFRI.*

## 3.3 Farms and farm investment

Two dominant trends in Manitoba farming have been the decrease in the number of farms and the increase in the size of farms. From 1996 to 2006, the number of farms in Manitoba declined from 24,400 to 19,054, a drop of 21 per cent. In the 15-year period from 1971 to 1996, the number of farms declined by 30 per cent (because some farms have more than a single operator, Manitoba has more farm operators, 26,625, than farms) (2006 Census of Agriculture).

The increase in farm size has been even more dramatic. In 1971 average farm size was 219 hectares, in 1996 it was 317 hectares, while in 2005 it was 405 hectares. The total capital value had gone from $13.9-billion in 1999 to $17.9-billion in 2006 (Livestock Stewardship Panel 2000; 2006 Census of Agriculture)

In 2006, total outstanding farm debt was $5.8-billion, up from $3.5-billion in 1999. Table 3.3 shows the changes in assets, liabilities, net worth, and the assets to debt ratio.

**Table 3.3: Manitoba farms: assets, liability, net worth.**

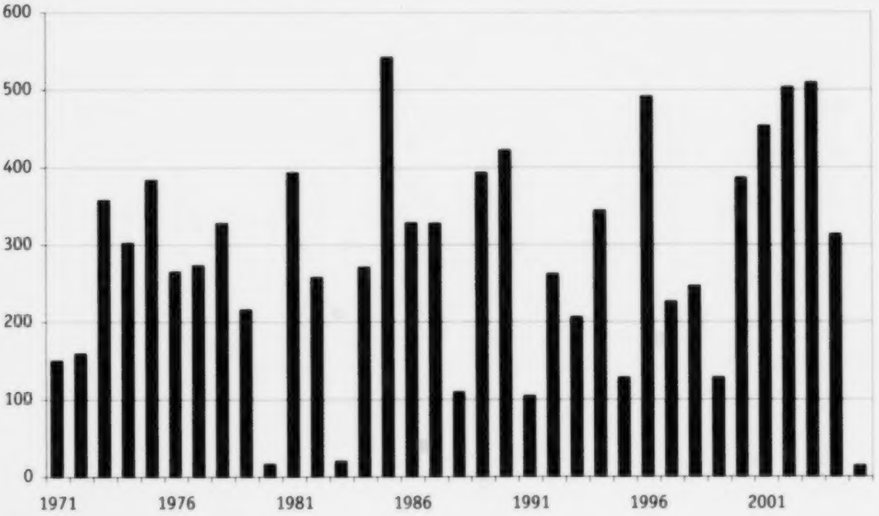
| | 1997 | 2006 |
|---|---|---|
| **Average farm assets** | **$716,500** | **$960,782** |
| Average farm liabilities | $123,900 | $287,494 |
| **Net worth** | **$592,600** | **$673,289** |
| Equity to asset ratio | 83 per cent | 70 per cent |

*Source: Livestock Stewardship Panel 2000, MAFRI 2007.*

## 3.4 Farm income

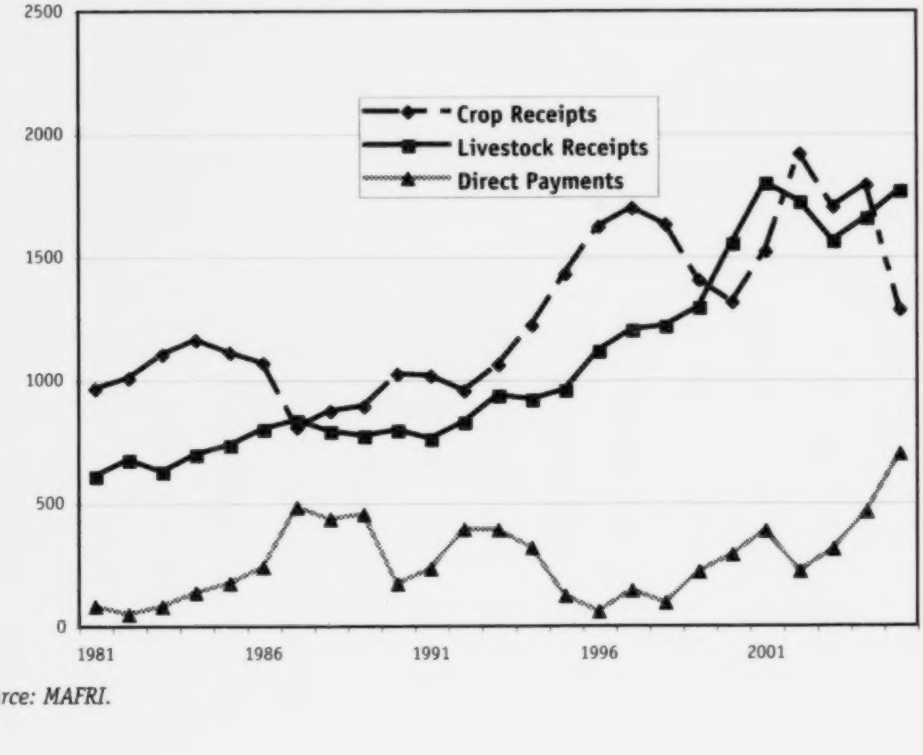
Farm income remains prone to dramatic swings. Figure 3.1 shows the total net farm income from 1971 to 2005. Figure 3.2 traces the growing importance of livestock to the Manitoba agriculture sector. (Direct payments referred to in this figure are direct government to producer payments and can include revenue from crop insurance and

**Figure 3.1: Total net income per farm in Manitoba 1971-2005 (in millions of dollars).**



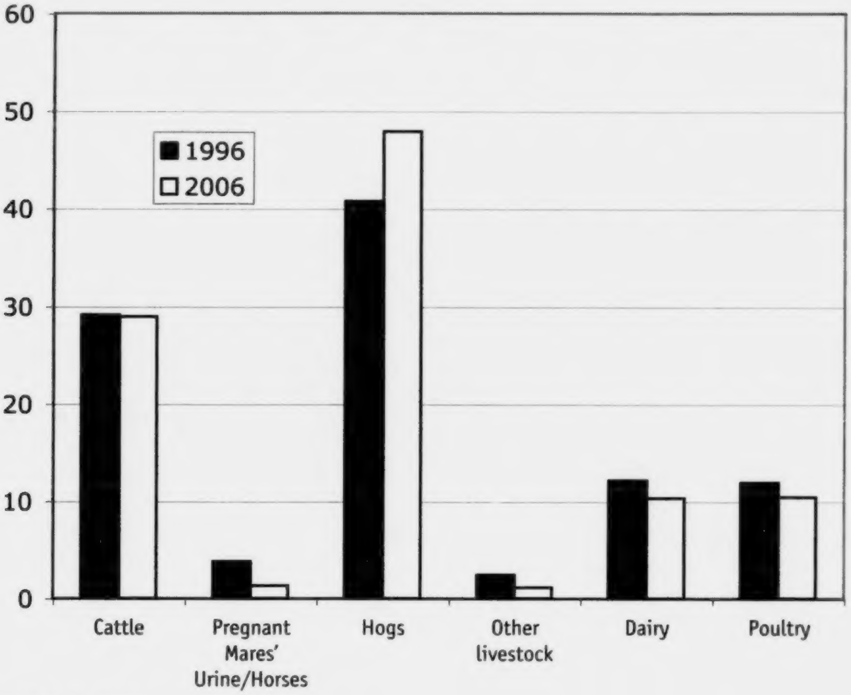
*Source: MAFRI.*

**Figure 3.2 Farm cash receipts by type in Manitoba 1981-2005 (in millions of dollars).**



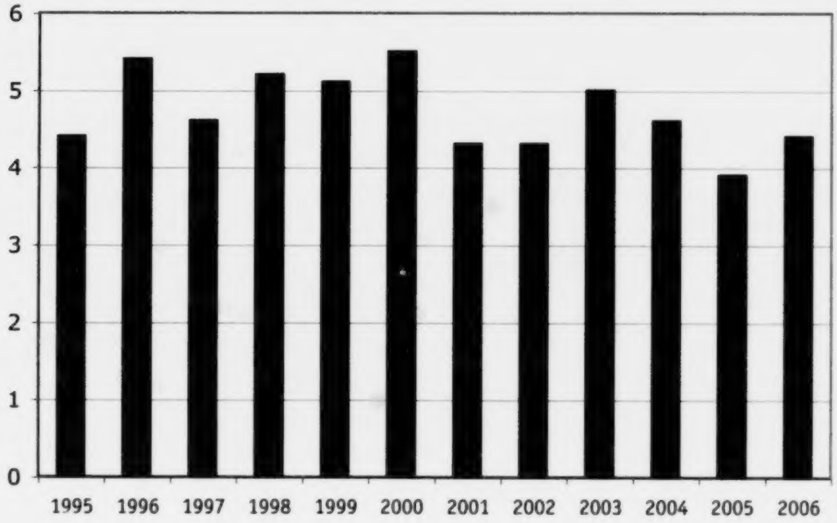
*Source: MAFRI.*

**Figure 3.3: Manitoba livestock type: Percent of total production value, 1996 and 2006.**



Source: Brewin et al. 2007.

**Figure 3.4: Agriculture's industrial percentage share of the provincial gross domestic product**



*Source: MAFRI.*

various income stabilization programs). Figure 3.3 indicates the role hog production plays within the livestock sector.

## 3.5 Agriculture's significance to provincial economy

Figure 3.4 sets out the annual percentage contribution of agriculture to the Provincial Gross Domestic Product from 1995 to 2006.

One out of every 11 jobs depends on agriculture (down from one in ten in 2001). According to MAFRI, in 2006, 29,000 Manitobans were directly employed by the agricultural sector, down from 32,800 in 2000. In short, while agriculture remains an important part of the Manitoba economy, its revenues are subject to significant swings, ownership is increasingly concentrated, and its percentage contribution to provincial GDP and employment is either static or declining. One of the most dynamic sectors in the provincial agricultural economy has been hog production: the next chapter outlines the dramatic growth of this production sector in North America over the past half century.

# 4 Evolution of the North American hog-production industry

The hog-production industry is one of the most important sectors of Manitoba's agricultural economy. It is an important market for Manitoba grains and its cash income is valued at an estimated $834-million for 2006 (Brewin et al. 2007). It is also significant at the national level; Canadian farmers received $4.3-billion from the sale of hogs (Commissioner of the Environment and Sustainable Development 2005). The emergence of Manitoba as a North American pork powerhouse has taken place over the past fifteen years, not without considerable controversy at times. This chapter places that expansion in a North American context, while the following chapter describes the current state of the industry.

## 4.1 The hog-production revolution in North America

Up until the 1950s, most hogs in North America were raised from birth to market weight in pens or buildings close to one another (such operations are termed farrow-to-finish operations). Hogs were usually part of a mixed farm operation: they could be fed cheaply on low-quality grain crop waste while their manure could be used to improve soil quality. The numbers of hogs that farmers raised depended in large measure on available resources, the hog-market cycle (which generally rose and fell over a four-year period), and the grain-market cycle (since farmers might increase their hog holdings to add value to surplus grain when grain prices were low) (Rhodes 1995; Broadway 2006; Naylor et al. 2006; Steinfeld et al. 2006). In short, they provided mixed farmers with meat, manure, and a measure of diversification and risk reduction.

Over the past sixty years, that model of hog production in North America has undergone a dramatic transformation, part of what has been described, on a global level, as the Livestock Revolution. For the hog industry, important developments in that revolution have included:

- The use of artificial insemination (largely a post-1960 development).
- Grain-feeding of hogs (a mid-1950s development) and the establishment of large-scale feedmills capable of producing precise formulations. Corn is the most commonly used feed in the United Sates and Britain, while barley predominates in Canada and continental Europe. In a significant break from the past, the feed is usually not a product of the farm operation that is raising the hogs.
- U.S. agricultural policies that kept the price of corn low. Feed is estimated to amount to from 50-65 per cent of the cost of raising a hog to market weight.
- Year-round confinement of hogs in barns.
- Storage of liquefied manure in a variety of in-ground and above-ground storage units. The manure would generally be applied to nearby fields.
- Development of clearly defined stages of production (breeding, gestation, farrowing, lactation, pre-nursery, nursery, grower, and finishers).
- Development of a three-site (breeding, nursery, and finishing) production system.
- Development of feeding strategies for each portion of the animal's development.
- Developments in antibiotics and disease treatment that made it possible to house large numbers of hogs in confined operations.
- Rapid genetic improvements made possible by the hog's short lifecycle.
- Concentration and integration of ownership and production that allow large-scale producers to control economic risk and pathogens (Haley 2004; Harris 2000; McBride 1997; Naylor et al. 2006; Rhodes 1995; Steinfeld et al 2006).

These practices, when combined, provided producers with more piglets per litter, more successfully weaned piglets, and a reduction in the time it took to get them to market weight. It became possible to produce as much pork as had been produced in the past with fewer hogs, less feed, and fewer workers. During the 1990s, the size of the U.S. breeding herd declined even as production increased (Benjamin 1997; Harris 2000). Operations that could incorporate all of these changes could expect to produce pork at a cost of ten per cent less than traditional farrow-to-finish operators (McBride 1997). The widespread adoption of these practices has led to a continuing decline in the number of farms raising hogs and the growth of large, integrated pork producers (Benjamin 1997; Rhodes 1995). Operations that have organized production on these lines are typically referred to as either intensive livestock operations (ILOs, this is the common Canadian term) or confined animal feeding operations (CAFOs, this is the common U.S. term) to distinguish them from the traditional extensive, land-based forms of animal husbandry.

The industry became increasingly mobile. To take advantage of the low-cost corn and soy that became a key element of hog diets in the post-Second World War period, the industry was initially concentrated in the Corn Belt states of the American mid-west. In the late twentieth century, it spread to a number of states that had not traditionally been associated with the hog industry, the most notable being North Carolina, where farmers were looking for alternatives to tobacco farming and the cost of land and labour were low. North Carolina became the second largest pork producer in the United States and home to the world's largest packing plant (McBride 1997; Rhodes 1995).

As hog production became more predictable and profitable, it attracted large investors interested in the potential revenue stream being created by the industrialization of this sector. With this investment, producers were able to contract out a portion of production and expand into processing. Companies such as Cargill, Tyson, and Premium Standard Farms began to play a major role in all aspects of the industry: feed, production and processing (Rhodes 1995). Because the new technologies were not developed for small-scale production, many producers were not able to make the sort of capital investment required to industrialize their operations. As a result, the structure of the industry has changed as dramatically as its technology. In the United States a model developed in which hog producers, often known as integrators or contractors, contracted with smaller producers, referred to as growers, to feed hogs to market weight. Under these contracts, producers supplied growers with management services, hogs, medicines, and additional inputs. The producers would normally focus on the most specialized aspects of production, particularly farrowing, while growers could contract the right to run nurseries or finishing operations (McBride 1997; Rhodes 1995). The independent farrow-to-finish operations went into rapid decline in the 1990s: in 1992 they produced 65 per cent of total market hogs in the U.S., by 1998 this had fallen to 38 per cent (Haley 2004). Twenty years ago, 37 per cent of U.S. hogs were on farms with inventories of more than 1,000 head, ten years later that number had risen to 71 per cent (McBride 1997). In 1995, the United States became a net exporter of pork (although it continued to be a net importer of live hogs, with most of its imports coming from Canada) (Benjamin 1997). Not only were most of the hogs coming to market from large farms, they were coming to market on the basis of multi-year contracts between growers and producers. By as early as 1995, 59 per cent of U.S. hogs were brought to slaughter through either integration (where the producer and processor were structurally integrated) or multi-year contracts. The packing industry underwent a similar concentration; by 1997 six plants processed 29 per cent of the U.S. hog production (McBride 1997).

## 4.2 The three-site model and all-in, all-out production

In the late 1980s, the industry evolved what is termed the three-site model, which has largely supplanted the traditional farrow-to-finish operation. The three sites are the:

- Sow or breeding barns (these are home to sows and gilts, which are unbred female hogs). A sow pregnancy usually lasts 115 days. In most intensive operations, pregnant sows are housed in what are termed gestation stalls. There are usually 11-13 piglets a litter.
- Nursery barns (for 5-23 kilogram weanlings).
- Grower-finisher barns (for feeder hogs marketed at 110-115 kilogram live weight).

The piglets are weaned at 18-28 days and moved to nursery barns. The piglets have their tails docked (to prevent tail-biting) and male piglets are castrated (the meat of uncastrated male hogs has an unmarketable boar taint). The piglets in the nursery barns are also referred to as isoweans because they are being weaned in isolation from sows and from larger hogs. Hogs usually can spend five to eight weeks in the nursery barns (their stay in a nursery barn can be as short as two weeks), and 16 to 18 weeks in the finishing barns. The sows usually recover from farrowing in 14 days and produce approximately 2.2 litters a year.

The goal of the three-site system is to prevent infection of the hogs. There are two interconnected advantages to raising hogs in infection-free conditions. The first, and most obvious, reason is to avoid the serious financial loss that can accompany infection. Second, hogs that are free of infection gain weight more quickly and have more lean meat.

The three-site system was accompanied by the development of the all-in, all-out flow model in which all sites, locations, buildings, and rooms are populated in one day with animals that are either the same age or are sows at the same point in their pregnancies. When the animals leave, again on the same day, the room is cleaned, disinfected and left empty for a short period before new animals are brought in. Under ideal conditions, the operations are located in well-isolated areas characterized by a low density of hogs in the region (Harris 2000).

The three-site system is a form of biosecurity response to the fact that diseases are more easily transmitted when hogs (or any other animals) are raised in high densities. Many hog operations employ additional biosecurity measures, including requirements that people have no contact with other hogs for 48 hours prior to entering a barn and that they shower on entering and leaving the barn. Operations often have quarantine barns for incoming hogs.

## 4.3 The impact on Canada

The U.S. revolution in hog production had significant repercussions in Canada, leading to the creation of a large export-oriented industry. The Canadian hog industry had been concentrating prior to the 1990s; for example, from 1971 to 1991, the average number of hogs per farm increased from 66 to 345 hogs, while the number of farms with hogs fell fourfold. Canadian hog production was concentrated in four provinces: Quebec, Ontario, Alberta and Manitoba. During the 1970s the hog industry started to develop as a large-scale export industry, with live exports being more predominant in the west than in Ontario and Quebec. Starting in the 1970s, Quebec farmers established confined hog-production systems and, by 1981, there were over 50 operations with over 4,600 hogs each. During the 1970s that province's share of Canadian hog production went from 17 to 33 per cent (Broadway 2006).

### 4.3.1 Export industry

While the U.S. exports less than ten per cent of its hog production, Canada exports over fifty per cent of its production. In 2004, eight million of the 100-million hogs slaughtered in the U.S. came from Canada (two-thirds of them as feeders, one-third as slaughter animals). The finishing usually takes place in Corn Belt states, with the slaughter animals being shipped to locations that have hog deficits. In 1989, Canada exported just one million hogs to the U.S. (16 per cent feeders, 84 per cent slaughter animals). The number and composition of Canadian exports has changed dramatically: the numbers are up and the feeder share of those numbers is up significantly. Canada accounts for 99 per cent of the hogs imported to the United States with more than half of those animals entering the U.S. through North Dakota in 2004. By that year 18 per cent of the feeders in Iowa came from Canada (Haley 2004).

### 4.3.2 Growth factors

The growth in the Canadian hog industry, particularly in the Canadian west, was assisted by two important factors in the 1990s: the repeal of the *Western Grain Transportation Act* (WGTA), and the low value of the Canadian dollar in relation to the U.S. dollar. The WGTA was the last vestige of the Crow Rate, which had been established in the late nineteenth century to provide Prairie farmers with freight rate assistance for shipping grain by rail to Canadian ports. It was viewed by many in the livestock industry as a barrier to the development of a pork industry in western Canada since, under its provisions, it was cheaper to ship grain to Quebec where it could be fed to hogs than to ship processed pork similar distances (Broadway 2006).

The repeal of the WGTA created market problems for Prairie grain farmers, particularly in Manitoba, many of whom were hit with what amounted to a $40 an acre increase in transportation costs. Conversely, the end of the WGTA effectively reduced hog production costs in Manitoba by $10 a hog (Grier et al. 2007). In response to the loss of the WGTA, Manitoba producers, assisted by the Manitoba government, developed a provincial hog-production strategy.

Because the price for Canadian hogs is largely set in the United States, the low Canadian dollar of the 1990s created a premium for Canadian producers. The more recent increase in the Canadian dollar has reduced the profitability of the Canadian industry, causing it to lose ground in the non-U.S. export market (Haley 2004).

A subsidiary factor in the rise of the industry in the late 1990s was the 1997 expiration of a U.S. countervailing duty that had limited Canadian access to the U.S. hog market.

## 4.4 Social conflict and environmental concerns

The industrialization and expansion of hog production in North America has given rise to a number of social and environmental controversies. Questions have been asked as to whether smaller producers, who lacked contractual agreements with large producers or processors, would be forced to shoulder more of the cost of price swings and whether they would lose access to markets during periods of over-production. More significantly, the siting of intensive livestock operations became increasingly controversial. In many localities, groups of residents formed organizations to oppose proposed hog-production operations. While they identified a wide range of specific concerns, particularly relating to odour and water, overall, opponents spoke of their concern as to whether existing environmental regulations could ensure sound environmental conduct. This critique was coupled with an emphasis on the need for public participation in the decision-making process.

In response, producers have argued that, since they operate environmentally sound state-of-the-art facilities, they do not constitute a threat to the environment. It is their position that the key decision-making questions revolve around land use as opposed to environmental regulation. While they acknowledged odour to be an issue, they took the position that this was being addressed through a variety of technical developments and that, furthermore, some odour was a fact of rural life. Where the producers argued that they were bringing jobs and development to marginalized communities, their opponents made a case that the benefits of such development were unlikely to be retained in such communities, since the industry was replacing labour with machinery that was not purchased locally. These conflicts have led to a variety of outcomes: some jurisdictions have welcomed the operations and amended laws to ease their arrival, while others have opposed the development. Perhaps the most significant development was the moratorium on industry expansion that North Carolina imposed in 1997. In 2002, Quebec responded to the growth of the hog farming industry and citizens' concerns by declaring a moratorium on the expansion of existing hog farms and on the development of new hog farm operations; it remained in place until 2005. The expansion of the hog industry in Manitoba has also generated social conflict. The most common conflicts have arisen at the municipal level when local residents have opposed proposals to establish intensive hog operations in their municipality (Benjamin 1997; Broadway 2006; Constance and Bonnano 1999; Manitoba Pork Study Committee 1994; Novek 2003; Rhodes 1995).

## 4.5 The expansion of the Manitoba industry

Throughout the twentieth century Manitoba agriculture was dominated by the export-oriented wheat sector. Hog production took place in the context of a mixed farm, operation with inventories peaking at 668,000 during WWII and declining to 400,000 in the post-war period. In the late 1960s, in response to a dramatic decline in the demand for Canadian grains on the international market, the federal government encouraged Manitoba farmers to increase their hog and cattle production. The number of hogs in Manitoba increased from 526,000 in 1968 to 884,000 in 1970 (Ryan 1977). Shortly thereafter, grain demand increased and hog production declined (Wilson and Tyrchniewicz 1995).

Prior to 1990, Manitoba hog production was characterized by fluctuations that were largely based on price, with producers entering and exiting production in rising and falling waves. Hogs were marketed through a hog marketing board, which had been established in the 1960s by the Manitoba government in response to producer complaints that the packing companies were combining to keep prices down. Participation in the board, initially voluntary, became mandatory in the 1970s (Broadway 2006).

### 4.5.1 Hutterite colonies and Manitoba hog production

Manitoba's Hutterite Brethren have been a mainstay of the province's hog-production industry for well over half a century. Since arriving in Manitoba in 1918, the Hutterites have been able to preserve their communal lifestyle by developing rural colonies that engage in agricultural activities. Currently 115 colonies in Manitoba raise hogs, with an annual production of 1.4 million or 15 per cent of total provincial production (MAFRI).

### 4.5.2 The Manitoba expansion

In 1993, when the industry was on the brink of its most recent expansion, the Manitoba pork industry exported 70 per cent of its production of 2.3 million hogs a year. There were 2,334 commercial enterprises producing hogs (446 farrow to weanling, 311 farrow to weanling or finish, 666 farrow to finish, and 800 finishing operations). It was recognized that the industry exported a large percentage of live hogs relative to pork (in 1993 live hogs accounted for 42.4 per cent of hog and pork exports, up from 32.6 in 1989). Manitoba packing plants, whose combined capacity was 1.8-million hogs, were running from 15 to 35 per cent below processing capacity. Of the farms that shipped live hogs, 76.5 per cent of the producers accounted for only 19.5 per cent production, while 4.9 per cent of the producers (101 of the province's 2,334 producers) accounted for 44.7 per cent of production (Manitoba Pork Study Committee 1994).

The late 1990s saw the emergence of a large-scale hog-production sector in Manitoba. The industry was intended to capitalize on what was sometimes described as the Manitoba advantage: cheap land, cheap feed, and a low-population density in rural Manitoba (Broadway 2006). The framework for this expansion was proposed in the 1994 report *Manitoba's Pork Industry: Building for the 21st Century Prospects and Challenges*, prepared by the Manitoba Pork Study Committee (Dr. Clay Gilson, Dr. David Donaghy, and Gerry Moore). At the time of the study's completion, it was estimated that Manitoba's pork industry (from producers through to retailers) employed approximately 12,000 people and generated $500-million in revenues. The report recommended that the province adopt a strategy aimed at doubling pork production and processing in a five-year period. While the industry had doubled over the previous 15 years, it was felt that the existing structure and approaches would not allow for the anticipated expansion, which it was estimated would cost approximately $350-million. Of this, $300-million would be directed to the production side of the industry and $30-million to $60-million would be invested in a new slaughter plant. It was estimated that a 1,000 sow farrowing operation would cost $1.8-million, with the farmer requiring $700,000 of equity. It was recognized that it would be difficult for most farmers to make this sort of investment, and that a variety of arrangements, such as feed companies providing the hogs and the feed and the farmer providing the barn, might be necessary. Government could assist in the expansion through loans extended through the Farm Credit Corporation, the Manitoba Agricultural Credit Corporation, and Manitoba Grow Bonds (Manitoba Pork Study Committee 1994).

The Manitoba government assisted in the development of an industrial hog sector in a number of ways. In 1994, it introduced a Livestock Waste Regulation and *The Farm Practices Protection Act* and Farm Practices Protection Board (all of which are discussed at length in subsequent chapters). In 1996, it did away with the single-desk selling system, establishing a new system under which producers could either market their hogs through third parties, particularly, the Manitoba Pork Marketing Cooperative, or individually. The government also passed legislation establishing the Manitoba Pork Council (MPC). The Council is funded by a mandatory levy of 80 cents per slaughter hog and export breeding stock and 19 cents per export weanling. The MPC currently has approximately 1,400 members. The Council is involved in a variety of activities including funding research, member education, quality assurance and food safety, and lobbying.

The provincial government also concluded negotiations with Maple Leaf Foods that led to the opening of a new slaughter and processing plant in Brandon. While Schneider Foods had been projecting an expansion of its Winnipeg operation, Maple Leaf Foods purchased the company in 2001 and placed the expansion on hold.

By 2000, the three-site model was common in large-scale hog operations in Manitoba. In a typical three-site operation in Manitoba:

- Site 1 would have a sow or breeding barn with 1,200-1,500 sows.
- Site 2 would have four to five nursery barns with 2,000-2,500 weanlings each.
- Site 3 would have three to five grower-finisher barns with 2,000 finishers each.

Such operations might have a total of 8-11 barns and 15,500 to 22,500 hogs on three sites. (Manitoba Government 2000a).

In this model, the hogs are raised indoors, in barns with slotted floors. The feces and urine fall through the slots and collect in under barn containment units that are flushed into large manure storage facilities (either above-ground or in-ground). An alternative model, often referred to as hoop barns or enviro-tech, has also developed. It involves raising hogs in hooped structures that resemble greenhouses. The structures are usually covered with polyethylene on the sides and throughout much of the year, the ends of the structures are open to the elements. These systems use what is termed a deep-bedding manure management system in which the hogs' bedding is comprised of composting organic matter such as straw. The hogs will use a portion of the bedding for sleeping and portion to urinate and defecate. The straw absorbs the urine, while the composting process serves as a heat source for the hogs. When the hogs are sent to market, the manure is removed, usually with a front-end loader to a location where it can be composted. This method accounts for approximately 10 per cent of Manitoba production (MAFRI 2007).

Manitoba hog production grew from 1.3 million in 1980 to 8.8 million in 2006. The biggest increase came in the last decade when production increased from 4 million in 1997 to 8.8 million in 2006. Figure 4.1 charts the growth of Manitoba production.

While hog-production numbers have climbed steadily over the past quarter century, the value of hog production has been variable, reflecting the four-year cycle in pork prices. Figure 4.2 outlines the value of Manitoba hog production since 1960.

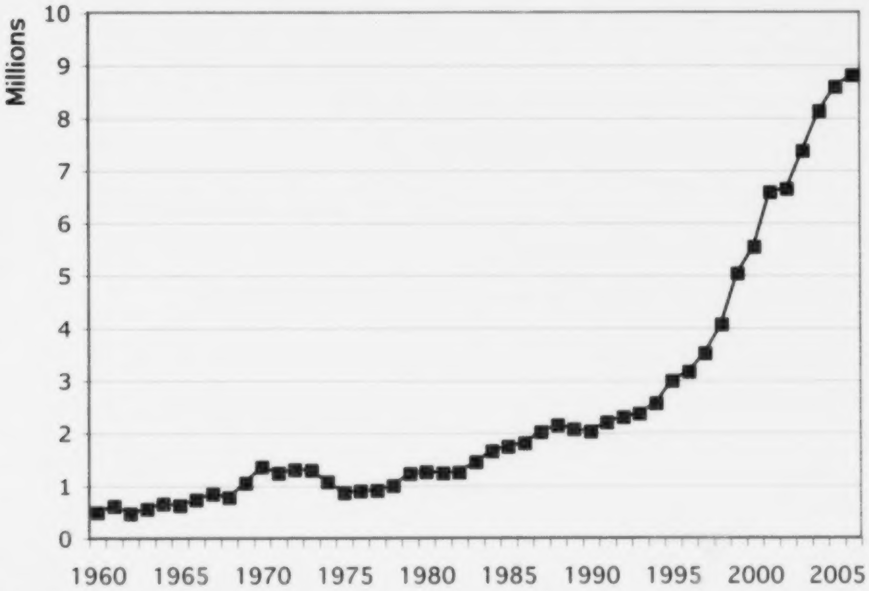
Table 4.1 outlines the annual increase in capacity over the past 12 years. The table shows the number of barn spaces that were created each year for sows and grow/finisher hogs. As the table makes clear, over the last five years there has been a decline in the rate of expansion of sows, while the expansion of grower/finisher hogs peaked in 2001, but remains significant. Manitoba Agriculture, Food and Rural Initiatives (MAFRI) estimates that the expansion of the hog industry generated $875-million worth of construction over the last 11 years.

**Table 4.1: Annual expansion of barn spaces for sow and grow/finish hogs (1995-2006).**

| Year | Sow | Grow/Finishers |
|---|---|---|
| **1995** | **13,980** | **93,200** |
| 1996 | 16,286 | 69,116 |
| **1997** | **25,545** | **121,900** |
| 1998 | 28,185 | 91,293 |
| **1999** | **18,840** | **79,250** |
| 2000 | 30,995 | 137,587 |
| **2001** | **54,265** | **132,731** |
| 2002 | 31,700 | 87,160 |
| **2003** | **16,250** | **69,212** |
| 2004 | 170 | 13,183 |
| **2005** | **2,720** | **68,467** |
| 2006 | 1,800 | 43,453 |
| **Total** | **240,736** | **1,006,552** |

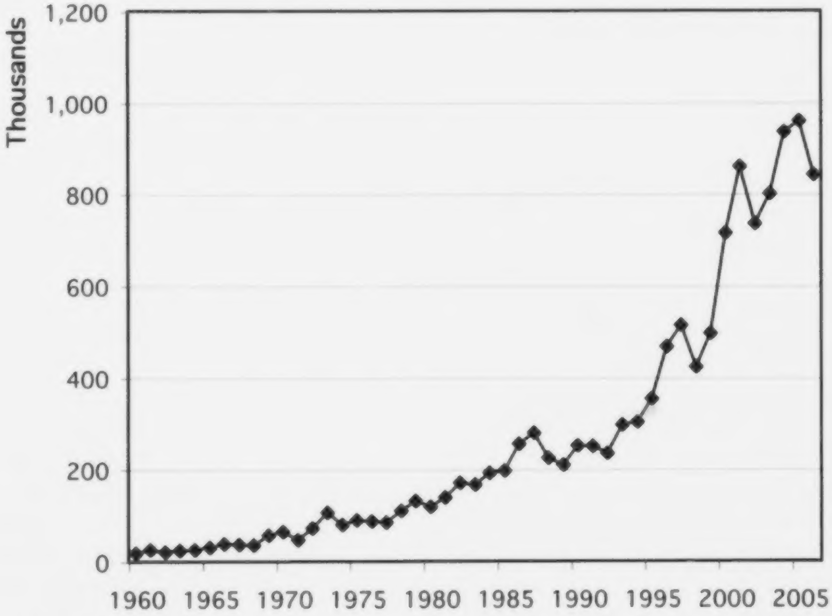
*Source: MAFRI.*

**Figure 4.1: Manitoba hog production, 1960 to 2006**



*Source: Statistics Canada: Agriculture and Agri-Food Canada; Canadian Food Inspection Agency; Manitoba processing plants.*

**Figure 4.2: Manitoba hog-production value (thousands of dollars) 1960-2005.**



*Source Statistics Canada; Agriculture and Agri-Food Canada; Canadian Food Inspection Agency; Manitoba processing plants.*

# 5 Current state of Manitoba hog industry

Hog production is now the largest and most dynamic single commodity in Manitoba's agricultural economy. Manitoba is also the country's leader in hog production and hog exports. In 2006, hog production was the largest source of farm receipts of any single agricultural commodity in the province. In that year, Manitoba's hog production of 8.8 million head was worth $834-million (Brewin et al. 2007).

According to the George Morris Centre, from 2004 to 2006, the average farm cash receipts for Manitoba hog farms were $905-million. This accounted for 51 per cent of total livestock farm cash receipts and 26 per cent of total farm cash receipts from crops and livestock combined. From 1997 to 2006, Manitoba's share of total Canadian hog farm cash receipts rose from 16 to 24 per cent. Profit margins for hog producers remain slim: from 2004-2006 Manitoba producers made between nothing and $2 per head profit. Manitoba packers lost between $45- to $50-million between 2004 and 2006 (Grier et al. 2007).

Production has become dramatically concentrated, with 20 per cent of producers accounting for 78 per cent of production (See Table 5.2). From 1995 to 2004, the annual growth rate of production in Manitoba hog production was 12.6 per cent, up from 4.6 per cent for the previous decade. The growth rate has slowed in recent years, dropping to 2 per cent in 2006 (Brewin et al. 2007).

Canadian and particularly Manitoba hog production has proven to be more efficient than U.S. production in terms of hogs per litter and hogs per breeding animal. This has been attributed to the cooler weather, which inhibits disease and increases lactation. The degree to which barns are well spaced from one another also reduces the risk of diseases travelling from one barn to another. Finally, since the industry is not as well established in Canada as it is in the United States, the diseases associated with the industry are also not as well established (Grier et al. 2007; Haley 2004). A number of studies have argued that the Canadian production advantage may apply more to breeding, gestation, and nursery operations, and that finishing is cheaper to carry out in the United States where feed costs are low and the finishing operations are in close proximity to processing plants (Broadway 2006; Haley 2004; Tyrchniewicz and Gregory 2003).

## 5.1 Decline in number of hog operations

At the start of 2007, Manitoba had (according to Statistics Canada), 1,280 hog farm units. This represented a decline of 23 per cent since 2002. During the same period, the number of hog farms in Saskatchewan and Alberta dropped by 27 and 34 per cent respectively, while the national decline was 21 per cent (Grier et al. 2007). Table 5.1 outlines the changes in the number of operations and the number of hogs in Manitoba over the past quarter century. The fact that an operation has ceased to raise hogs is not necessarily a sign that the operation has closed, since many of the smaller operations are mixed farm operations that may have simply moved out of hog production.

**Table 5.1: Trends in number of hog farms, hogs per farm, and total hog production.**

| | 1990 | 2000 | January 1, 2007 |
|---|---|---|---|
| **Manitoba hog farms** | **3,150** | **1,450** | **1,280** |
| Average number of hogs per farm | 388 | 1,290 | 2,596 |
| **Hog production in hogs** | **3.2 million** | **4.8 million** | **8.8 million** |

*Source: MAFRI, Finding Common Ground 2001.*

The 8.8 million hogs a year figure does not represent the number of hogs on Manitoba hog farms at any one time, since most of the hogs produced are being marketed by seven months of age. Four million weanlings are marketed within weeks of their birth. As a result, at any one time, there are approximately three million hogs on Manitoba farms. Figure 5.1 shows the average number of hogs per farm and number of hog farms in Manitoba.

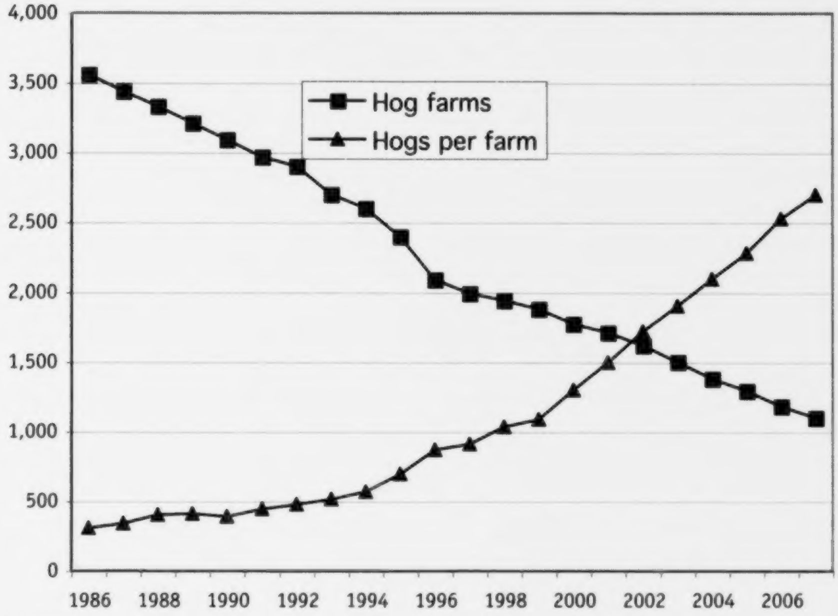
## 5.2 Concentration of production

According to the 2006 census, 768 Manitoba farms were predominantly hog operations (farms where hogs account for 50 per cent or more of total potential receipts). These operations owned 355,370 of the 7,718,571 hectares of farmland in Manitoba (Grier et al. 2007). In 2006, just under 21 per cent of the operations (244 operations) were responsible for 78 per cent of the hogs. Twenty per cent (240) had fewer than 20 hogs on the farm (Brewin et al. 2007). As Table 5.2, shows, 58 per cent of Manitoba hog farms accounted for only 6 per cent of the province's hog population. As will be discussed in Chapter 9, this concentration has environmental consequences.

## 5.3 Structure of the Manitoba industry

The hog-production sector has undergone a dramatic change over the past 15 years, in large measure reflecting the transformation of the North American hog-production industry. Key elements

**Figure 5.1: Average number of hogs per farm and number of hog farms in Manitoba, July 1, 1986-2006.**



*Source: MAFRI.*

of this change have been: the rise of the three-site production system, the decline in the number of operators raising hogs, the increase in the size of hog operations, the consolidation of production under the leadership of a limited number of production companies that are linked to other steps in the production process (typically feed and processing), and the use of production contracts with smaller operators to organize production.

Three large hog-production companies, Elite Swine, Hy-Tek, and Puratone, have played a key role in developing the industry in Manitoba. These companies favoured the three-site production method, built many of the original barns, and entered into production agreements with farmers to operate nursery and finisher barns for their

**Table 5.2: Manitoba hog farms by herd size.**

| | Hog farms | | Total hogs | |
|---|---|---|---|---|
| Herd size | Number | Per cent of total | Number | Per cent of total |
| All farms reporting | 1,188 | 100 | 2,932,548 | 100 |
| 1 to 99 | 327 | 27.5 | 5,901 | 0.2 |
| 100-499 | 212 | 17.8 | 58,314 | 2.0 |
| 500-999 | 156 | 13.1 | 110,575 | 3.8 |
| 1,000-2,499 | 189 | 15.9 | 289,309 | 9.9 |
| 2,500-3,999 | 60 | 5.1 | 179,167 | 6.1 |
| 4,000 and more | 244 | 20.5 | 2,289,282 | 78.1 |

*Source: Statistics Canada, Census of Agriculture, 2006: special tables sponsored by Manitoba Pork Council.*

hogs. Under this development model, it was common for barns to be built relatively close to feed mills. By 2006, these three companies controlled 40 per cent of the sows in Manitoba (Grier et al. 2007).

While each company has a different and evolving business model, they often own or control transport fleets, genetics laboratories, construction companies, and manure-management companies. Some companies focus on their own hogs, raising them either in barns they own or in barns that are owned by local farmers (or investor groups), while others focus on managing hogs in barns that are owned by investors or local farmers. In most cases, regardless of ownership, the hogs are raised according to a regime stipulated by the production company. Veterinary services, hog marketing, preparation of manure management plans, and the application of manure are usually arranged by the management company or supplied by the marketing company employees. Management agreements generally require the barn owners to use feed produced by the hog-production company.

Elite Swine told the Commission that it owned or managed 109,000 sows and 1.9 million market hogs, with two-thirds of its production in Manitoba (all three of the large hog-production companies have international connections). Elite Swine is currently restructuring its production to reduce the number of sows that it owns and manages. Hy-Tek representatives stated they had 57,000 sows and raised one million hogs a year, 65,000 of which were raised to market weight. Puratone representatives told the Commission that it owns, operates, and manages 46,000 sows and produces and manages one million hogs, one half of which are raised to market weight.

The fact that all three companies were developed out of a base in southeastern Manitoba played an important role in developing the industry in that region. Twenty-eight per cent of Manitoba hogs are concentrated in two rural municipalities in south-east Manitoba. In 2006, the RM of La Broquerie had 445,683 hogs and the RM of Hanover had 388,905 hogs (Rawluk and Flaten 2007). Figure 5.2 illustrates the distribution of Manitoba hog farms by type and agricultural region. Map 5.1 shows Manitoba's agricultural regions. Map 5.2 shows the distribution of Manitoba hog production facilities as documented by the Manitoba Pork Council.

Manitoba's Hutterite colonies retain a significant share of Manitoba's hog production. Unlike the other large-scale producers, the Hutterite colonies do not contract out production or maintain three-site operations. Holding 35 per cent of the provincial sow base, they constitute the main farrow-to-finish operations in Manitoba. Over the past decade most colonies have doubled the number of sows that they house—moving from a range of 600-to-800 to a range of 1,000-to-1,200 (Grier et al. 2007). Most of the hogs sold for slaughter in Manitoba (approximately 90 per cent) are sold with some form of contract or marketing agreement (Grier et al. 2007).

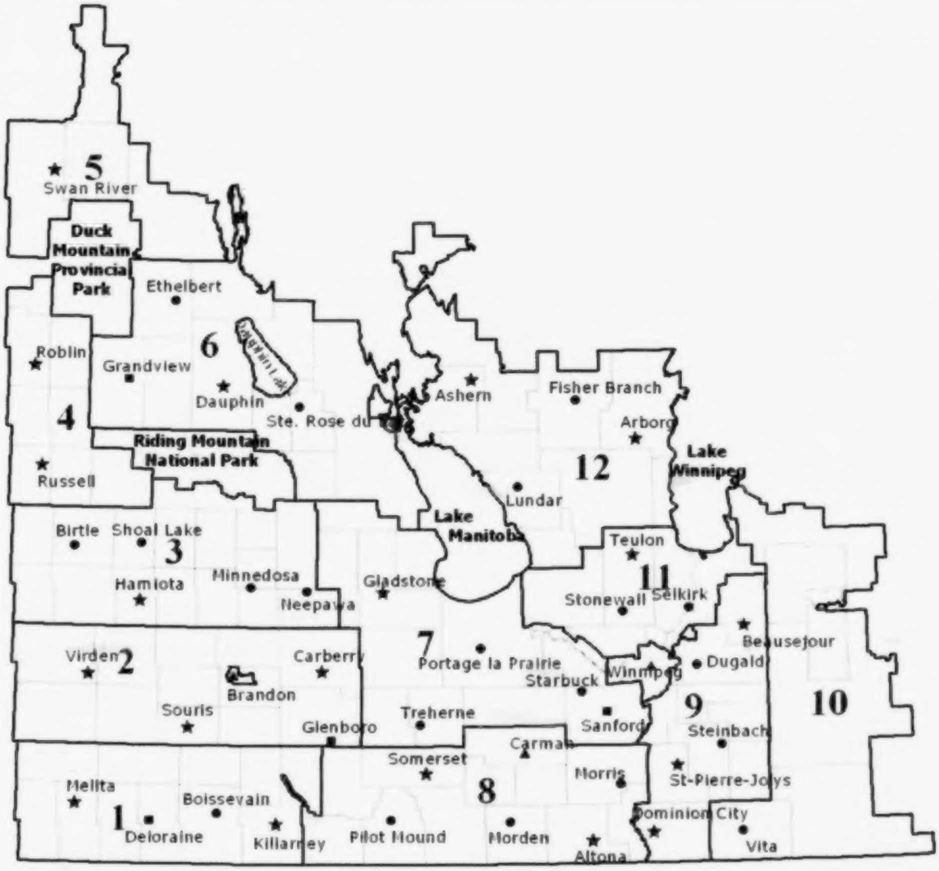
### 5.3.1 Hog farms with field crops

As Table 5.3 indicates, larger hog-production operations are less likely to have their own field crops and are more dependent on access to the fields of grain producers for manure disposal than smaller operators, while mid-size operators are the most likely to own crop fields.

## 5.4 Slaughter

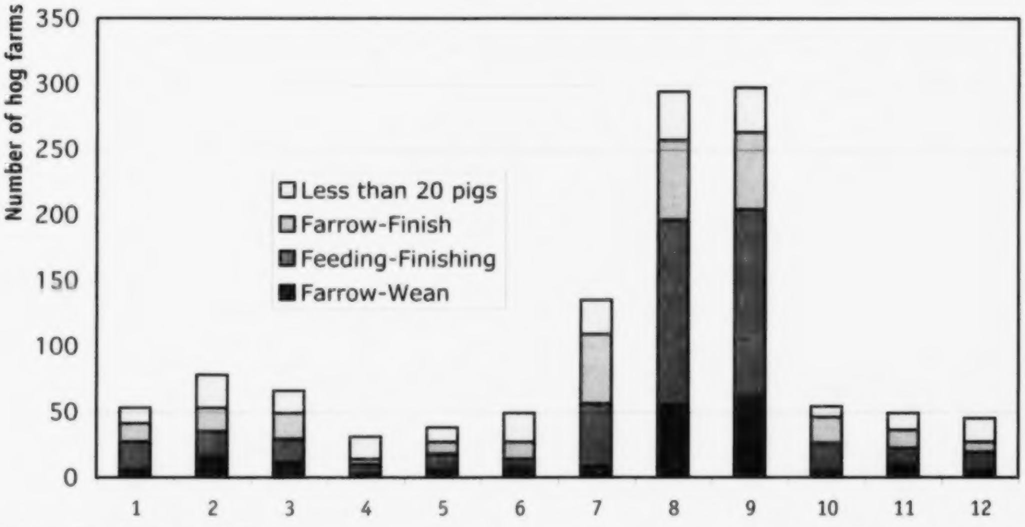
In 2006, 4.3 million hogs were slaughtered in Manitoba, 3.4 million of which originated in Manitoba. It should be noted that not all hogs slaughtered in Manitoba come from Manitoba. In 1999, 515,000 of the 1.9 million hogs slaughtered in Manitoba came from Alberta, Saskatchewan and Ontario, while in the first half of 2007, the proportion of out-of-province hogs slaughtered in Manitoba increased from nine per cent to 15 per cent, due in large measure to the closure

**Map 5.1: Manitoba's agricultural regions.**


5
Swan River
Duck Mountain Provincial Park
Ethelbert
6
Roblin
Grandview
Dauphin
Ste. Rose du Lac
Ashern
Fisher Branch
Arborg
4
Riding Mountain National Park
Russell
12
Lake Winnipeg
Lundar
Lake Manitoba
Teulon
Birtle
Shoal Lake
3
Hamiota
Minnedosa
Neepawa
Gladstone
11
Stonewall
Selkirk
Beausejour
7
Virden
2
Carberry
Brandon
Portage la Prairie
Starbuck
Winnipeg
Dugald
Souris
Glenboro
Treherne
Sanford
9
Steinbach
10
Carman
Somerset
8
Morris
St-Pierre-Jolys
Melita
Boissevain
1
Deloraine
Killarney
Pilot Mound
Morden
Altona
Dominion City
Vita

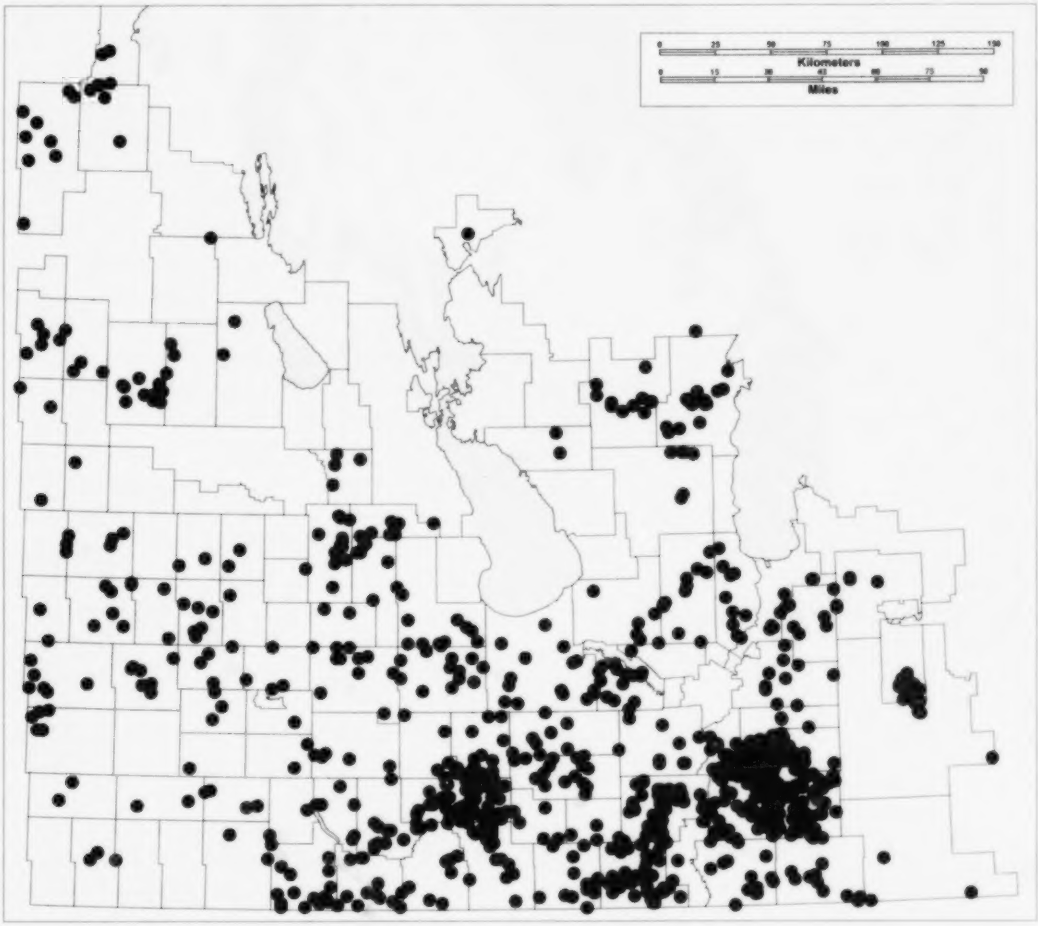
*Source: MAFRI*

**Figure 5.2: Number of Manitoba hog farms by type and agricultural region, 2006.**



*Source: Brewin et al. 2007*

**Map 5.2: Distribution of Manitoba hog operations.**



*Source: Manitoba Pork Council.*

**Table 5.3: Manitoba hog farms with crop fields (including hay).**

| Herd size | Number of farms | Percentage of hog farms with crop fields | Acres | Hectares |
|---|---|---|---|---|
| All farms reporting | 868 | 100 | 1,048,459 | 424,297 |
| 1 to 99 | 243 | 73.1 | 86,669 | 35,074 |
| 100-499 | 175 | 74.3 | 102,683 | 41,554 |
| 500-999 | 128 | 82.5 | 97,119 | 39,303 |
| 1,000-2,499 | 125 | 82.1 | 119,376 | 48,310 |
| 2,500-3,999 | 39 | 65.0 | 62,727 | 25,385 |
| 4,000 and more | 158 | 64.8 | 579,885 | 234,671 |

*Source: Statistics Canada, Census of Agriculture, 2006: special tables sponsored by Manitoba Pork Council.*

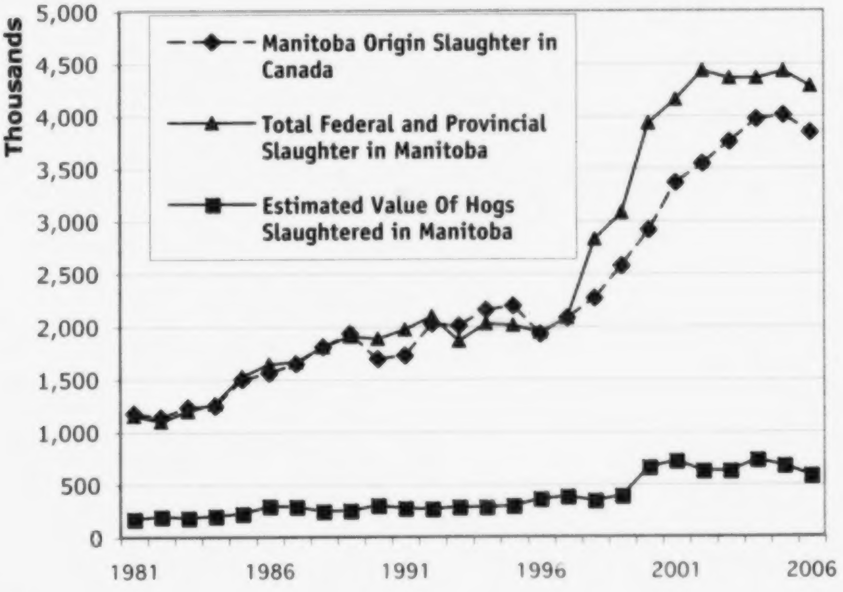
of a Saskatchewan packing plant (Livestock Stewardship Panel 2000, Grier et al. 2007, MAFRI 2007). During this period, export of Manitoba hogs to the United States was approximately 10 per cent higher compared to the same period the previous year (MAFRI 2007). The closing of a Saskatchewan facility and the proposed closing of Winnipeg operations will put pressure on Manitoba producers who wish to have their animals slaughtered in Manitoba.

Canadian slaughter capacity has not kept pace with the dramatic increase in Canadian hog production, increasing by 38 per cent from 1995 to 2003, while production increased by 66 per cent during the same period. Key to this has been the fact that Canadian plants have often not been able to offer prices that are competitive with those offered by U.S. plants (Haley 2004). During the 1970s and 1980s, Manitoba lost much of its slaughter and processing capacity, so that by the 1990s, hogs were slaughtered at the Springhill plant in Neepawa and at the Schneider Foods plant in Winnipeg.

The number of hogs slaughtered in Manitoba has doubled over the past ten years due to the opening of the Maple Leaf Foods processing plant in Brandon in 1999. Figure 5.3 shows the Manitoba hog slaughter for 1981 to 2006.

The 2000 *Finding Common Ground* report prepared for the Manitoba government anticipated that through an expansion of the Schneider Foods plant in Winnipeg and the addition of a second shift at Maple Leaf Foods in Brandon, Manitoba would soon have a slaughter capacity of ten million hogs, four million more than the capacity in 2000. It estimated that an investment of $750-million in barns, equipment, breeding stock and land would be needed to produce enough hogs to meet that slaughter capacity level. However, the anticipated increase in slaughter capacity has yet to materialize. Maple Leaf Foods purchased Schneider Foods and is in the process of closing rather than expanding its Winnipeg slaughter operations. A second shift is planned for

**Figure 5.3: Manitoba hog slaughter statistics (number of hogs slaughtered and value of slaughter), 1981-2006.**



*Source: MAFRI.*

the Maple Leaf Foods plant in Brandon but has yet to commence operation. When the second shift is added, the plant is expected to have a capacity of 90,000 a week or 4.68 million a year. This expansion has to be balanced with a recognition of the fact that slaughter capacity is being reduced in Saskatchewan and Winnipeg. The lack of sufficient slaughter capacity is one of the causes behind the high volume of hogs exported to the United States.

## 5.5 Export

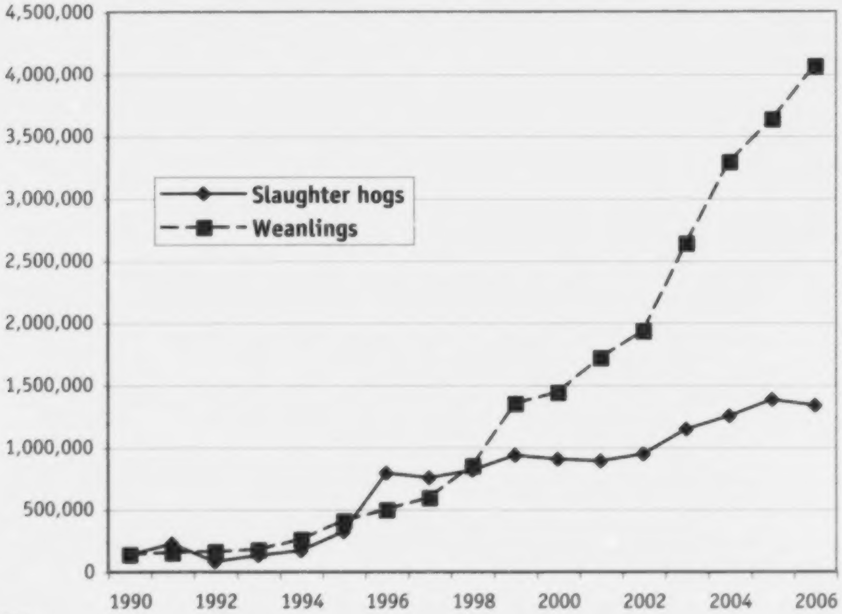
The Manitoba pork industry is an export industry—whether they are sold as live animals or as pork, 80 per cent of Manitoba hog production leaves the country (Grier et al. 2007). In 2006, Manitoba exported 5.4 million hogs (4.1 million weanlings and 1.3 million market hogs) to the U.S., up from five million the previous year. The total value of the 2006 hog exports was $374-million (the weanling and slaughter hogs were valued at $187-million each). The total value of the 2005 export was $418-million (MAFRI 2007)—in short, while the volume was up from 2005 to 2006, revenue was down. The exported weanlings are usually sold shortly after birth at a weight of seven kilograms (Brewin et al. 2007). Figure 5.4 outlines the trends in Manitoba exports of slaughter hogs and weanlings.

Pork exports and revenue were both down in 2006 from the previous year, with Manitoba exporting $409-million worth of pork, down 13 per cent from the previous year. The volume of pork export dropped by 7 per cent compared to the previous year.

While the United States is essentially the sole market for Manitoba hogs, the pork market is more diverse. In 2005 and 2006, the three major pork customers were the United States (34 per cent) Japan (28 per cent) and Mexico (17 per cent) (Grier et al. 2007).

Exports sales to the U.S. take place under a variety of arrangements including retained ownership, contracts and third-party brokers, as well as sales on the cash or spot market (although these constitute a minority of sales) (Grier et al. 2007).

**Figure 5.4: Manitoba exports of slaughter hogs and weanlings (in number of hogs), 1990-2006.**



*Source: MAFRI.*

Figure 5.5 charts the value of Manitoba pork exports from 1995 to 2006.

## 5.6 Impact on Manitoba economy

The George Morris Centre conducted an economic analysis of the Manitoba hog production on behalf of the Commission for this Investigation. As a part of that review, it applied the Statistics Canada Input-Output Model to the industry. This is a model that incorporates all producer and processor input activity: grain farms, feed mills, and other suppliers. Table 5.4 summarizes the key findings of that analysis.

According to this analysis, in Manitoba, the hog-production sector generates $1.7-billion in economic activity (defined as total revenue generated by the industry as well the revenue generated by its supplier sectors as a result of the industry), nearly 5,000 jobs, and pays $500-million in wages, contracts, benefits and other income.

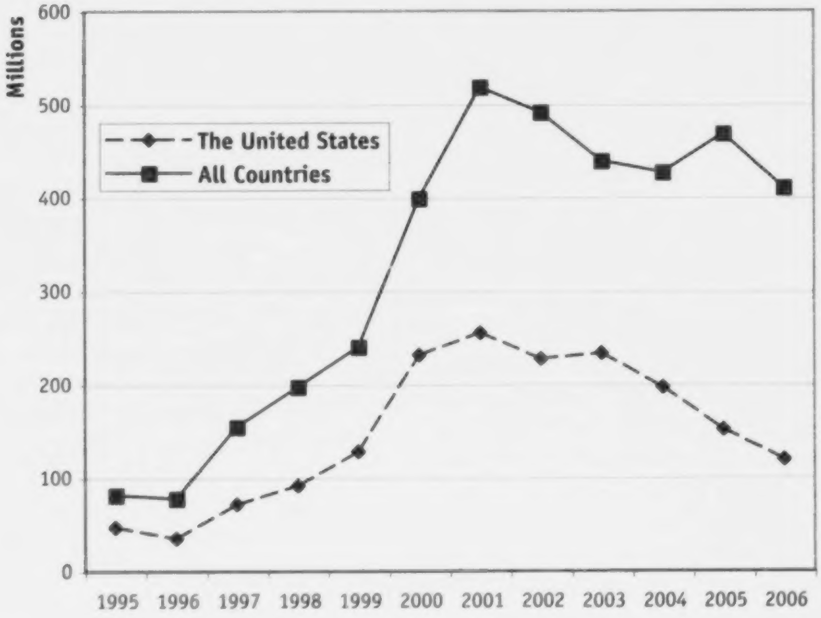
**Table 5.4: Economic activity generated by Manitoba hog farms.**

| | **Manitoba** | **Canada (includes Manitoba figures)** |
|---|---|---|
| **Indirect taxes on production** | **$27 million** | **$36 million** |
| Wages, Contracts, Benefits and Other Income | $504 million | $723 million |
| **Direct employment in the industry** | **1,382** | **1,382** |
| Indirect employment in the industry | 3,394 | 5,777 |
| **Total employment in the industry** | **4,775** | **7,159** |
| Total economic activity | $1.7 billion | $2.2 billion |

*Source: Grier et al. 2007*

The economic activity generated by the Manitoba pork packing industry is summarized in Table 5.5. It should be noted that because there are so few processors in Manitoba, the Statistics Canada model, for

**Figure 5.5: Manitoba pork export values in millions of dollars, 1995-2006.**



*Source: MAFRI.*

reasons of confidentiality, does not provide direct and indirect employment figures. However, the George Morris Centre estimates there are likely to be 2,500 people directly employed in the industry in Manitoba and 1,200 indirectly employed in the industry.

**Table 5.5: Economic activity generated by Manitoba pork packers.**

| | Manitoba | Canada |
|---|---|---|
| **Indirect taxes on production** | **$12 million** | **$36 million** |
| Wages, contract, benefits and other income | $360 million | $723 million |
| **Direct employment in the industry** | **n/a** | **n/a** |
| Indirect employment in the industry | n/a | n/a |
| **Total employment in the industry** | **3,713** | **5,607** |
| Total economic activity | $1.2 billion | $1.7 billion |

*Source: Grier et al. 2007.*

The George Morris Centre identified the following impacts for the hog-production and processing industry in Manitoba:

- Total jobs generated in Manitoba: 7,500 (hog farming plus direct estimate for packing).
- Total wages, contracts benefits, and other income $610-million.
- Total economic activity: $2 billion.

### 5.6.1 Feed

According to the Manitoba Pork Council (MPC), the Manitoba hog-production industry consumes more than two million tonnes of feed per year, valued at $450-million. One quarter of the feed consumed by the industry is imported from the United States. Ration ingredients vary from year to year, depending on input costs. The MPC told the Commission that, in 2005, the ration consisted of 0.2 million tonnes of wheat, 1.0 million tonnes of barley, 0.1 million tonnes of canola meal, 0.4 million tonnes of corn, 0.2 million tonnes of soy meal, and a small portion of oats. According to the MPC, an additional 1.3 million tonnes of feed would be needed to bring all Manitoba hogs to slaughter weight. The George Morris Centre estimated that the industry was a market for about $500-million in grains and feedstuffs (Grier et al. 2007).

## 5.7 Issues facing the industry

An inventory of the major issues facing the industry are:

- Rising feed costs.
- Labour shortages.
- Slaughter capacity and cost.
- An appreciating Canadian dollar.
- Access to export markets.

### 5.7.1 Feed costs

Feed costs have been estimated as constituting between 50 and 65 per cent of production costs. One of the primary drivers of the expansion of the Manitoba hog-production industry was the search for a market for Manitoba grain. Ready access to low-cost Manitoba grain, particularly barley, was seen as a key element in the Manitoba advantage. However, in recent years that advantage has been disappearing, as U.S. corn yields continue to rise while the corn prices paid by U.S. hog producers fall. According to the George Morris Centre, this provides Minnesota producers an eight-dollar-a-head feed advantage over Manitoba hog producers.

In coming years, this may be offset by the growing ethanol market, which is driving up the price of corn in the U.S. While the growth of ethanol production in Canada is also increasing, the possibility exists that the overall impact will be to reduce the U.S. feed advantage (Grier et al, 2007). The hog industry itself believes that the biofuels sector will drive up the price of feed.

Canadian Food Inspection Agency (CFIA) regulations have also affected the Manitoba hog industry in two ways that relate to the environmental impact of the phosphorus content of the manure that the animals excrete. The CFIA's decision to classify a form of barley with highly available phosphorus as a novel feed has brought that grain's development to a halt. If such a feed were to become available, it would eliminate the need to add dicalcium phosphate to feed, thus reducing producer costs and the phosphorus levels in hog manure. Second, the CFIA has not adjusted its phosphorus requirements for hog feed to take into account the impact that the addition of phytase has on the level of available phosphorus in hog diets (the potential impact of phytase is discussed in Chapter 9). Such an adjustment would also reduce producer costs and the phosphorus levels in hog manure.

### 5.7.2 Labour

Labour accounts for 10 per cent of the cost of hog production (and up to 20 per cent of the non-feed costs). Manitoba wage rates for livestock workers are two dollars an hour higher than those paid in the Midwestern United States. This differential provides U.S. producers with a one-dollar-a-head advantage.

### 5.7.3 Slaughter capacity and price

Larger packing plants enjoy considerable economies of scale and U.S. plants have considerably more capacity than Canadian plants, particularly if they run double shifts. This can amount to a five-dollar-a-head advantage for U.S. processors. Table 5.6 outlines the difference in scale between Canadian and U.S. packing plants.

**Table 5.6: Relative packing plant sizes, Canada and U.S.**

| | U.S. | Canada | Quebec |
|---|---|---|---|
| Average Daily Capacity | 13,000 | 3,200 | 2,700 |
| Five largest average daily capacity | 21,000 | 8,4000 | 5,500 |
| # plants>40,000 head per week | 20 | 3 | 0 |

*Source: Grier et al. 2007.*

The U.S. packing industry was highly centralized in 2001 and remains so today, with four firms controlling 61.4 per cent of daily slaughter capacity (up slightly from 60 per cent in 2001). In Canada, the industry has recently undergone a significant rationalization, currently two processors have 51.8 per cent of the daily kill capacity (Livestock Stewardship Panel 2000, MAFRI). As noted above, the closing of slaughter plants across the prairies will leave Manitoba producers competing with other prairie producers for access to Canadian slaughter plants.

### 5.7.4 An appreciating Canadian dollar

When the Manitoba hog-production industry expanded in the mid-1990s, the Canadian dollar was trading at two-thirds the value of the U.S. dollar, providing the Canadian sector with a considerable benefit. As the relative value of the dollar has increased, this benefit, which was enjoyed by both producers and packers, has disappeared.

### 5.7.5 Access to export markets

Unlike other major pork producing countries, Canada is dependent on exports. Canada exports 50 per cent of its production, and Manitoba exports 80 per cent of its production. By comparison, the U.S. exports 10-13 per cent of production, the European Union exports 7 per cent, and Brazil 25 per cent. The Food and Agriculture Policy Research Institute estimates that despite the various challenges facing the Canadian hog industry, Canadian exports, after experiencing a short-term downturn will continue to grow over the coming decade (Grier et al. 2007).

One of the most immediate challenges to Canada's access to the U.S. market is the U.S. Country of Origin Labelling (COOL) law set to come into effect by October 1, 2008. This law will require U.S. retailers to label all fresh pork and beef as to their country of origin. U.S. packers will be faced with two choices: 1) stop purchasing Canadian hogs or 2) segregate Canadian hogs within their packing operations, a measure which will increase their costs and drive down the price they are prepared to pay for Canadian hogs.

# 6 Barriers to sustainability

The Commission has been mandated to carry out an investigation of the environmental sustainability of the hog-production industry. As noted in Chapter 2, the Commission has concluded that in assessing the environmental sustainability of the industry, it is assessing if it can be maintained indefinitely in light of its impacts on air, land, water, flora, and fauna. Given the fact that potential impacts on water quality and quantity figure so significantly in any discussion of the environmental sustainability of the hog industry, the Commission has adjusted the order of these topics to place water at the head of the list. Under each of these headings, the Commission further identified the potential barriers to sustainability.

This chapter will provide a brief overview of the issues and their implications for the Manitoba hog-production industry. The following chapter will outline the regulations that the Manitoba government has put in place to address the risks that these factors represent in Manitoba. It should be made clear that, simply because a risk has been identified in this chapter, does not mean that it necessarily exists in Manitoba or that it is not being managed in a way that mitigates potential damage.

## 6.1 Water

### 6.1.1 Water quantity

Hogs require varying amounts of drinking water, dependent upon the stage they are at in the production process and the conditions in which they are being housed. Water is used to cool hogs in barns in summer and for cleaning hog housing facilities. Most of Manitoba hogs are produced in systems that store manure in liquefied form. These operations require water to flush the barns and transport the manure to the storage system.

There are several reasons to be concerned about the amount of water that an intensive hog-operation uses. The first relates simply to the issue of water conservation: depending on the water source, water used by a hog operation could be permanently lost to a region. Beyond this concern are issues of waste. Highly dilute manure is costly to transport and is more likely to have an imbalance of nitrogen to phosphorus (an issue discussed below) and the more water per hog that an operation uses, the greater the dilution of the manure. In short, excess use of water may be a threat to both local and regional water sources and may exacerbate manure and nutrient handling issues for the operation.

### 6.1.2 Water quality

Concerns over the amounts of water used by livestock operations are matched by the impacts that outputs from livestock operations can have on surface and groundwater. Most of these impacts can come from the nutrients, pathogens, and heavy metals in the manure. There are numerous routes through which these contaminants can travel: losses at any point in the transportation and storage systems, failure of storage systems, infiltration to groundwater, as well as runoff and overland flow from fields on which the manure has been applied. In the case of liquefied manure there are economic limits as to the distances that the manure can be transported, a fact that can lead to geographically concentrated application of manure to land.

The method of application, particularly of liquefied manure, can have a significant impact on the rate of nutrient loss from the field. Losses are best controlled when the manure is either injected directly into the soil or is incorporated shortly after application. Losses are greater when the manure is surface applied. Surface application is also connected with increases in greenhouse gas emissions and in odour-related complaints. Nutrients in manure that is applied to frozen or snow-covered ground also have a heightened risk of moving from the field to surface waters.

#### Nutrients

Nitrogen and phosphorus enter the hog production cycle in the rations that are fed to hogs. This can either be in the form of grain or, as is more commonly the case, pelleted feed (made from grain and other inputs) from feed mills. Federal government regulations require that commercial feeds contain a minimum level of these nutrients, which are essential to the healthy development of the hogs. Hogs are not able to absorb all the nitrogen and phosphorus in their feed (some of it is in a form that they cannot absorb). The nutrients that are not absorbed are excreted. The forms, paths, and fates of these nutrients once they have been excreted are key elements in any hog-production operation's impact on the environment.

Because nitrogen and phosphorus are just as crucial to healthy crop production as they are to the production of healthy hogs, hog manure is an effective fertilizer. Nitrogen improves the vigour, yield, and protein levels of a crop, while phosphorus is critical for all growth processes, promoting root development, early flowering, efficiency of water use, energy transfer, photosynthesis, respiration, cell division, and uniform ripening. Virtually all hog production operations seek to apply manure to fields so that crops can take advantage of these nutrients. Small operations apply the manure regularly throughout the year (and as a result, their operations can lose much of the fertilizer value, since winter-applied manure can be lost during spring runoff). Approximately ten per cent of operators compost the manure and apply it in solid form, while most large producers retain the liquefied manure in a storage system, applying it at specific times of the year. There is, however, a limit to the amount of these nutrients that crops can absorb and make use of—that limit is usually referred to as the crop-removal rate.

Most of the world's nitrogen exists in the atmosphere and is therefore not available to plants. Historically, nitrogen in the atmosphere has usually become fixed (or made available) for plant and animal life through the work of soil microorganisms that remove nitrogen from the atmosphere. These microorganisms interact with the roots of plants to create a form of nitrogen that can become available to plants to take up (Smil 2000).

It was not until the early twentieth century that technology was developed to synthesize nitrogen (from the atmosphere) and hydrogen (from natural gas) into nitrogen fertilizer. The creation of synthetic fertilizers has led to a significant increase in the nitrogen being applied to the soil (Smil 2000). Synthetic phosphorus fertilizer is processed from calcium phosphate rock deposits.

Due to the use of synthesized fertilizers, humans now release as much nitrogen and phosphorus to terrestrial ecosystems annually as all natural sources combined. Synthetic nitrogen fertilizer not only dramatically increased the productivity of world agriculture; it created a number of environmental challenges. Over the past century, our understanding of plant requirements for nitrogen has become more sophisticated; however, for many years nitrogen was overapplied (Smil 2000).

Nitrogen and phosphorus are the two most commonly used fertilizers in Manitoba agriculture. In Manitoba, the use of synthetic fertilizer has risen over the past three decades, with nitrogen going from 25,000 tonnes in 1965 to 265,000 tonnes in 2005 and phosphates going from 25,000 tonnes in 1965 to 106,000 tonnes in 2005. In recent years, there has been a decline in the sale of these nutrients: from 2003 to 2006, nitrogen sales declined by 12.3 per cent while phosphorus sales declined by 25.7 per cent. Livestock constitutes the other major source of these nutrients for Manitoba agriculture: Manitoba livestock produce 25,000 tonnes of manure phosphorus annually, with 70 per cent coming from cattle. Despite the fact that cattle produce more manure than hogs, the related nutrient-loss is not as significant as with hogs, since local forage crops recycle the majority of cattle manure, which is deposited directly onto pastureland (Lake Winnipeg Stewardship Board 2007; Rawluk and Flaten 2007).

Nitrogen (whether it be synthetic or in a manure) applied to a field can leave in a number of ways: it can return directly to the atmosphere, it can leach into the groundwater; it can leave through the process of soil erosion; or, having been incorporated into a plant, it leaves as part of the harvested crop (Smil 2000; Steinfeld et al. 2006). It can also remain in the soil where it was applied, increasing the nitrogen load in the soil.

Phosphorus is much less mobile and is far less likely to be turn into a gas or to leach into the soil. It travels from the land to water usually by erosion or runoff. It is also more likely to build up in the soil than nitrogen.

Elevated levels of nitrogen in water sources have been associated with methemoglobinemia (blue baby syndrome), miscarriage, and stomach cancer. While phosphorus is not a direct threat to the health of humans and animals, increased levels of phosphorus (and nitrogen) can change the biological balance in freshwaters. This is the result of eutrophication, the excessive growth of aquatic plants, particularly algae, in response to elevated levels of phosphorus and nitrogen. The increase in algae can lead to fish kills (as a result of decreased oxygen levels) and increases in associated toxins that can harm aquatic life, wildlife, pets, livestock, and people. Research has indicated that the level of phosphorus in the water is the limiting factor for the development of algae blooms (Steinfeld et al. 2006; Lake Winnipeg Stewardship Board 2007).

Ideally, nutrients should not be applied to fields at rates greater than the rate at which crops will remove them from the soil. Matching application with removal is in itself a complex process, requiring an understanding of the nutrient levels in the manure, the soil characteristics (including such issues as acidity and alkalinity), the rate at which the nutrients will be lost to the atmosphere following application, and the crop requirements. This is further complicated by the impact that the actual growing season has on crop growth and resultant nutrient uptake. Producers must also address the fact that the ratios of nitrogen to phosphorus in most manures are not the same as most crops' nitrogen and phosphorus requirements. A typical crop removal nitrogen-to-phosphorus ratio might be 6-to-1, while a typical manure ratio might be between 2-to-1 and 4-to-1 (Rawluk and Flaten 2007). As a result of this imbalance, producers have traditionally applied manure at rates that will meet their nitrogen requirements. In general this leads to an application of more phosphorus than most crops can utilize, leading to an increasing phosphorus load in the soil. Until relatively recently, it was thought that phosphorus was essentially immobile and did not leave the soil. Farmers were told that the build up of phosphorus was, in essence, money in the bank.

The final complication is the cost of transporting these nutrients. While liquefied manure is in many respects superior in quality to synthetic fertilizers, which are what most Manitoba farmers use, it is very costly to transport. The intensification of livestock production has exacerbated this problem. Manure ceases to be a valuable source of nutrients and becomes a waste disposal issue when the amount of manure that an operation produces is too large to be economically transported the distances that are required to ensure that it is applied at crop-removal rates.

### Pathogens

Pathogens are responsible for 90 per cent of most food and waterborne illness in humans. Livestock manure can contain a range of pathogens (bacteria, parasites, or viruses) that can continue to live for a period of time in manure applied to soil. They live in the gastro-intestinal tract of animals without affecting the health of those animals, but can cause illness when humans consume them in food or water. Diseases that jump from animals to humans are called zoonoses (Holley et al. 2007).

### Heavy metals

Hog feeds often also include heavy metals (copper and zinc being the most common). While some of these metals occur naturally in the feed, it is not uncommon to add metals, which can serve to promote growth and control disease. Metals that are in excess of the hog's nutritional requirements cannot be absorbed by the animal and are excreted. When the manure is applied to the fields these can become concentrated in the soil. Under certain conditions, excess concentrations of metals can have negative effects on crop yields and quality. Heavy metals are also at risk of eventually leaching into and contaminating ground and surface waters (Steinfeld et al. 2006).

## 6.2 Air

Livestock operations can emit well over one hundred different gases that can have global and regional impacts. The global issue most associated with the emissions from hog barns is climate change, while the most common regional issue relates to odour.

### 6.2.1 Climate change

Climate change is the result of changes in the balance of atmospheric forces that control such processes as the carbon, nitrogen, and oxygen cycles. A key component in this change has been the increase in the amount of so-called greenhouse gases (carbon dioxide, methane, nitrous oxide, and chlorofluorocarbons) present in the atmosphere as a result of human activity. The increased presence of these gases enhances their greenhouse effect, contributing to global warming. It is predicted that this process will contribute to a variety of undesirable environmental impacts including extinctions, rising sea levels, climate extremes, and dramatic changes to ecosystems.

Hogs, like all livestock emit carbon dioxide through their respiratory processes and minor amounts of methane through their digestive processes (ruminant animals such as cows and sheep emit far more), while their manure emits methane, nitrous oxides (combinations of nitrogen and oxygen), ammonia (a compound of nitrogen and hydrogen), and carbon dioxide. The extent of these emissions depends on the way the manure is managed.

The storage of liquefied manure in earthen manure-storage facilities leads to anaerobic decomposition and the release of methane into the atmosphere. Methane emission can also take place when liquefied manure is applied to fields. The United Nations Food and Agriculture Organization (FAO) estimates the global methane emissions from livestock manure management to be 17.52 million tonnes, with 8.38 million tonnes of that being attributed to hogs and 1.65 million tonnes of that coming from North American hog production (Steinfeld et al. 2006).

Nitrous oxide not only enhances the greenhouse effect, it depletes the ozone layer, thereby increasing radiation risks. Nitrous oxide can be lost to the atmosphere during the storage and application of animal manure with the rates being dependent on the method of storage and application.

When natural habitat is turned to cropland there is a decrease in the ability of the land to sequester carbon. To the degree that hog production leads to an increase in cropland (either to produce feed or to serve as additional spread fields for manure application) it increases the carbon dioxide in the atmosphere (Steinfeld et al. 2006).

### 6.2.3 Odour

Hog production facilities can emit ammonia, volatile organic compounds, hydrogen sulphide, and other odour-producing gases from animal housing facilities, manure storage facilities, fields on which manure is applied, and from mortality disposal sites. While some of the gases emitted from a hog-production facility can be toxic at high concentrations, the concentrations that exist outside the facilities are usually below such levels (Steinfeld et al. 2006). The odour sensation from these gases, even below toxic concentrations, can however lead to physiological symptoms and exacerbate existing medical conditions (Zhang et al. 2007). The World Health Organization (WHO) defined health as, "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO 2006, 1)" and the extent to which an individual or group is able, on the one hand, "to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment" (WHO 1986, 1). Odours from the hog-production industry may have an effect on quality of life that could result in frustration, annoyance, depression and stress, and therefore impact health within the broader definition. Odour can constitute a significant potential barrier to the social sustainability of all forms of livestock production

## 6.3 Land

### 6.3.1 Changes in land use

One of the major impacts of the Livestock Revolution has been the increase in the amount of land put under cultivation in order to produce feed for the increase in livestock. Globally, the increase in cropland between 1950 and 1980 was greater than the increase between 1800 and 1950. Much of this shift has taken place in the developing world, while, in the developed world, the trend has been a reduction in cropland.

The global result has been a loss in natural habitats and the environmental goods and services those habitats provide. For example, natural habitats foster and protect biodiversity, serve as carbon sinks (forests sequester carbon), regulate water cycles and reduce the impact of flooding, and can slow the flow of contaminants to surface waters. These services are, for the most part, not included in any cost-benefit calculations of economic development (Steinfeld et al. 2006).

## 6.4 Flora and fauna

The impacts of the hog industry on flora and fauna are closely inter-related and will be discussed together. Intensive livestock production has implications both for the biological diversity of flora and fauna and for the health of animals and humans.

### 6.4.1 Biological diversity

Biological diversity (often called biodiversity) refers to the diversity of genetic information, species, and ecosystems and habitats. Biological diversity underlies many of the ecological goods and services that support life, including:

- Conversion of solar energy into carbohydrates and protein.
- Oxygen production.
- Water purification.
- Climate moderation.
- Soil production.
- Purification of the air. (Environment Canada 1995).

The intensification of livestock production can have two very differing impacts on biodiversity. To the degree that it is carried forward without consideration of the environmental impacts of development, it can reduce biodiversity. However, to the extent that it leads to a more efficient use of land and resources, it can enhance biodiversity by reducing pressures on cultivated land (Steinfeld et al. 2006).

Biodiversity can be threatened by a number of trends associated with intensive agriculture. These include:

- Conversion of natural habitat to cropland.
- Water eutrophication.
- Impact of antibacterial resistance on wildlife.
- The reduction in diversity among livestock breeds.
- Climate change could lead to changes in natural habitat and the introduction of new pathogens and disease, potentially resulting in an increase in the number of animals threatened with extinction.
- Transfer of pathogens.

As the above list suggests, intensive livestock production can, in a number of ways, have a limiting impact on global biodiversity.

### 6.4.2 Health

The following health issues are related to hog industry: workplace health issues, animal diseases, and the role that drug use can play in increasing antibacterial resistance in both humans and animals.

### Workplace health and safety

Dust (arising from the animal hair, dried feces, and feed) and gases (particularly ammonia, hydrogen sulfide, and methane arising from the decomposition of urine and feces) may be acutely hazardous to the health of the people who work in hog-production facilities. These problems are more acute in winter, when there is reduced ventilation of the facilities to preserve heat. The liquefied manure also can release hydrogen sulphide, which can be fatal in high concentrations. Hog barn workers have died as a result of their being exposed to lethal levels of hydrogen sulfide upon entering collection pits beneath hog-production facilities shortly after the facilities have been drained.

There are at least 25 zoonotic infections (diseases that can be transmitted from animals to humans) that intensive livestock operation employees are at risk of developing (Cole et al. 2000; Donham and Thelin 2006).

### Animal diseases

The stringent levels of bio-security in many intensive livestock operations are a reminder that hogs are vulnerable to numerous diseases. Raising animals in concentrated sites can play a role in breeding new forms of these diseases. Increasing attention has been paid in this area to swine influenza. From the 1930s to 1998, North American hogs had been prey to only one influenza subtype. Since then, there has been a succession of influenza viruses. Debate exists as to whether the concentration of animals enhances the development of new influenza strains by providing a fertile breeding ground or whether by ensuring hogs do not come into contact with passing wildfowl the development of new influenzas is slowed (Wuethrich 2004).

An outbreak of an animal disease such as foot-and-mouth disease or classic swine fever would represent a significant threat to the Manitoba hog production industry. In the last decade outbreaks of these highly contagious diseases in Taiwan, the United Kingdom, and the Netherlands have led to a restructuring of industries and widespread public debate over the future of the industries. The impact of such diseases would be particularly significant for Manitoba, given the provincial hog industry's dependence on export markets for live hogs, since an outbreak would likely lead to border closures. The loss of access to export markets would likely result in the massive killing of healthy animals and a sharp drop in the price of slaughter hogs (Whiting 2003; Whiting 2006; Whiting n.d).

### Antibiotics

Antibiotics are administered to livestock for three purposes: 1) to treat disease, 2) to serve as a prophylactic at times of high risk, for example after weaning or during transport, and 3) to promote growth or performance. They can increase growth by 1 to 15 per cent. The use of antibiotics has been associated with the development of bacteria that are resistant to those drugs. This can happen either through genetic mutation or the bacteria acquiring resistant genes from another organism. When animals develop bacteria with resistance to antimicrobials with which they are treated, there are implications for both animals and humans. The potential routes by which drug resistant bacteria can spread to humans are through water, food, or inhalation. The longer a drug is in use, the greater the degree of resistance that develops. Furthermore, resistance is more frequent in communities where antibiotics are in common use. As resistance grows, infections are more difficult and expensive to treat. For human medicine, the most serious resistance problems are due to the overuse of antibiotics in treating humans (Government of Canada 2000).

As noted at the outset of this chapter, the issues identified above constitute potential barriers to the industry's environmental sustainability. The next chapter outlines the growth of livestock-related environmental legislation in Manitoba. In the second section of this report, the Commission presents its assessment of the effectiveness of those regulations and producer mitigation measures.

# 7 The growth of the regulation of the hog industry in Manitoba

The hog-production industry is a part of the broader livestock sector of the Manitoba economy and, with a few exceptions, there are few regulations that specifically target hog production. In short, the history of the regulation of the hog-production industry is part of the history of the regulation of the livestock sector. At the same time, it should be noted that over the past fifteen years, the hog-production sector has been the most controversial livestock sector in Manitoba and many regulatory changes have been in response to that sector's growth and development. This chapter outlines the history of provincial government environmental and land-use regulation of the industry. Although Manitoba Agriculture, Food and Rural Initiatives (MAFRI) does not act as an environmental regulator, it plays an important role in the development of environmental policy and, for that reason, its work is also summarized in this chapter, as are the measures that producers have taken to control nutrients. The chapter concludes with some comments on regulatory practices in other jurisdictions (Box 7.4).

At the outset, it should be noted that the federal, provincial and municipal governments all play a role in regulating agricultural operations in Manitoba.

### Federal jurisdiction

Through Agriculture and Agri-Food Canada and Environment Canada, the federal government as two general responsibilities:

1) Research and development to reduce the environmental impacts from agriculture in general. In 1998, Agriculture and Agri-Food Canada announced it would spend $2-million to develop a national approach to finding effective and affordable solutions to the environmental challenges of the hog industry by 2001.

2) Compliance with and enforcement of the pollution prevention provisions of the *Fisheries Act*. Nationally, between 2000 and 2005, Environment Canada prosecuted one hog barn for violating the *Fisheries Act* (Commissioner of the Environment and Sustainable Development 2005).

### Provincial jurisdiction

The Manitoba government is responsible for overall environmental regulation and land-use planning. The two most significant pieces of legislation for the regulation of the hog-production in industry are *The Environment Act* (and the Livestock Manure and Mortalities Management Regulation under that Act) and *The Planning Act* (and the Provincial Land Use Policies under that Act). Other provincial acts that can have a bearing on the livestock sector include:

- *The Animal Care Act*
- *The Animal Liability Act*
- *The Contaminated Site Remediation Act*
- *The Dangerous Goods Handling and Transportation Act*
- *The Endangered Species Act*
- *The Environment Act*
- *The Farm Lands Ownership Act*
- *The Farm Practices Protection Act*
- *The Farm Products Marketing Act*
- *The Livestock and Livestock Products Act*
- *The Municipal Act*
- *The Pesticides and Fertilizers Control Act*
- *The Planning Act*
- *The Public Health Act*
- *The Sustainable Development Act*
- *The Water Resources Administration Act*
- *The Water Rights Act*
- *The Workplace Safety and Health Act*

### Municipal jurisdiction

Municipal governments have the authority to issue building permits and establish zoning provisions within a framework established by the provincial government through *The Planning Act* and associated Provincial Land Use Policies (PLUPS).

This regulatory framework has undergone considerable change since the Manitoba government adopted *The Clean Environment Act*, the forerunner to today's *Environment Act*, in the late 1960s. The current Clean Environment Commission (CEC) Investigation is in fact the third major inquiry to be held into the impact of livestock on the environment (although the first to be specifically restricted to hog production). This section of the chapter outlines the evolution of the regulation of the industry and summarizes the findings of the previous investigations held into the livestock industry's impact on the environment, along with discussions of two other reports that looked at related issues. The Chapter is broken into two parts. The first deals with environmental regulation and the second deals with land-use decision-making.

## 7.1 Environmental regulations

### 7.1.1 Regulation of the hog industry in the 1960s and 1970s

*The Clean Environment Act* required that every new and existing industry, including livestock-production operations, file a proposal or register with the Clean Environment Commission, and subsequently receive an order that placed limits on the discharges to the environment (Manitoba Government 1978). *The Clean Environment Act* also provided citizens with the right to take environmental complaints to the CEC.

Following one such complaint, in 1971 the Commission ordered a Springfield-area hog operation to reduce in size from 2,000 to 800 animals and to eliminate its system of liquefied manure disposal. The provincial Municipal Board upheld the CEC ruling in February 1972. The Manitoba government of the day then amended *The Clean Environment Act* to allow the minister to overrule CEC decisions. The minister exercised this authority to exempt the Springfield operation from the CEC ruling. The residents who had filed the original CEC complaint then launched a nuisance suit against the operator. In 1975, the Manitoba Court of Queen's Bench, after finding in their favour, awarded them $10,000 (Wilson 1975). In 1974, while the case was before the courts, the Manitoba legislature adopted *The Nuisance Act*, restricting (but not eliminating) the right to sue for nuisance in the case of odour.

In 1973, the Manitoba government relieved agricultural operations of their responsibility to apply for a CEC order limiting their discharges (Manitoba Government 1978). Instead livestock operations over a certain size were required to abide by the Livestock Production Operations Regulation, which stipulated that:

- Manure be maintained on the operator's property.
- Manure not be discharged to water.
- Mortalities be rendered or buried (unless otherwise approved by the minister).
- There be no manure spills from vehicles carrying livestock.

Under this regulation, there was no need for a permit to build a manure-storage facility, no inspection of such facilities, and no restrictions on the application of manure. The regulation was subsequently amended to require the registration of some livestock operations, depending on their size and location. There was no inspection of operations except in response to complaints. At this point there was, in essence, no provincial approval process for the development or expansion of intensive livestock operations. If the rural municipality for which a new or expanding development was proposed had a zoning bylaw in place, the development might need to receive a conditional-use permit from the local council. However, many Manitoba municipalities did not have zoning bylaws during this period.

### 1978: CEC investigation into livestock production

In 1978, the Manitoba government mandated the Clean Environment Commission to undertake "an investigation of existing and potential air, soil and water pollution problems associated with intensive livestock production operations in Manitoba with the objective of development guidelines or regulations to provide a workable solution to such problems" (Manitoba Clean Environment Commission 1979, 1). In its report, the Commission noted that there had been a change in the intensity of livestock production that was likely to continue into the future. Where in the past "flocks and herds were more or less 'in balance' with the land and the recycling of wastes took place without creating problems," intensive livestock operations were "out of balance with nature because of the very large amounts of waste being produced on restricted areas of land" (Manitoba Clean Environment Commission 1979, 3). The two sets of problems identified with this development were:

- Risks of pollution to air, soil and water.
- The rise of land-use conflicts.

The Commission concluded that while *The Clean Environment Act, The Planning Act, The Municipal Act*, and *The Public Health Act* all provided sufficient authority for dealing with these issues, there was a need for guidelines and regulation to address pollution issues while zoning plans should be used to address land-use issues.

The Commission recommended that livestock operations with more than 300 animal units be required to register with the provincial government (Manitoba Clean Environment Commission 1979, 6). (An "animal unit' refers to the number of animals of a particular category of livestock that will excrete 73 kilograms of total nitrogen in a 12-month period. Its value is that it allows for cross-species comparisons and regulation. See Table 7.1 for full breakdown of Animal Units.) One of its most significant recommendations was a requirement that any new or expanding livestock operation exceeding 300 animal units require provincial government approval.

In large measure, the recommendations of this report were not implemented. In 1987, the Protection of Water Resources Regulation (under *The Public Health Act*) prohibited the depositing of manure into or along water bodies and gave the government the power to order the removal of manure in the case of such deposition.

### 7.1.2 The 1990s and the expansion of the Manitoba hog industry

The first major change in regulatory direction came in 1994, when the provincial government was in the process of directing a significant expansion of the hog-production industry. In that year, the province brought in the Livestock Waste Regulation, *The Farm Practices Protection Act*, and released the *Manitoba's Pork Industry; Building for the 21st Century*, the report of the Manitoba Pork Study Committee.

#### Livestock Waste Regulation: 1994

In 1994, the government replaced the Livestock Production Operation Regulation with the Livestock Waste Regulation. The new regulation established the following additional regulations:

- A requirement for a permit to construct earthen manure-storage facilities.
- Storage siting and construction standards for earthen manure-storage facilities.
- A requirement that manure storage not contaminate the environment.
- That manure application be on the basis of crop nitrogen requirements.
- Controls on composting of manure.
- A 100-metre setback from watercourses for field storage and manure storage facilities. 50-metre setbacks from wells and sinkholes.
- Incineration and composting were approved as additional methods for the disposal of animal mortalities.

This was the first time the province required permits to build storage facilities (and permits were not required for steel or concrete facilities) and the first time that it attempted to regulate the rate of application of manure. It did not at this time require manure management plans or inspection of manure-storage facilities.

## 1994: Manitoba's Pork Industry: Building for the 21st Century Prospects and Challenges

While the 1994 report, *Manitoba's Pork Industry: Building for the 21st Century Prospects and Challenges* (produced for the Manitoba government by the Manitoba Pork Study Committee), dealt primarily with economic issues, it did discuss sustainable development in a chapter titled "Related aspects of the pork industry." The chapter did not directly identify or discuss such environmental barriers to sustainability as nutrient loading, climate change,

**Table 7.1: Calculation of animal units by categories of livestock.**

| Animal | Type | Animal units produced by one animal | Number of animals to produce one animal unit |
|---|---|---|---|
| Dairy | Milking Cows, including associated livestock | 2.000 | 0.5 |
| Beef | Beef Cows, including associated livestock | 1.250 | 0.8 |
| | Backgrounder | 0.500 | 2.0 |
| | Summer pasture/ replacement heifers | 0.625 | 1.6 |
| | Feeder Cattle | 0.769 | 1.3 |
| Hogs | Sows, farrow to finish | 1.250 | 0.8 |
| | Sows, farrow to weanling | 0.313 | 3.2 |
| | Sows, farrow to nursery | 0.250 | 4.0 |
| | Weanlings | 0.033 | 30.0 |
| | Growers/finishers | 0.143 | 7.0 |
| | Boars (artificial insemination operations) | 0.200 | 5.0 |
| Chickens | Broilers | 0.0050 | 200.0 |
| | Roasters | 0.0100 | 100.0 |
| | Layers | 0.0083 | 120.0 |
| | Pullets | 0.0033 | 300.0 |
| | Broiler Breeder Pullets | 0.0033 | 300.0 |
| | Broiler Breeder Hens | 0.0100 | 100.0 |
| Turkeys | Broilers | 0.010 | 100.0 |
| | Heavy Toms | 0.020 | 50.0 |
| | Heavy Hens | 0.010 | 100.0 |
| Horses | Mares, including associated livestock | 1.333 | 0.75 |
| Sheep | Ewes, including associated livestock | 0.200 | 5.0 |
| | Feeder Lambs | 0.063 | 16.0 |

*Source: Provincial Land Use Policies Regulation.*

biodiversity, antibiotic use, or disease-related trade issues. It concluded that the Livestock Waste Regulation was sufficient to protect groundwater and surface water from pollution from earthen storage systems and that adequate regulation existed for the handling of manure (the regulation did not address above-ground storage facilities). Its essential position on environmental issues were signified by the following two sentences:

- "Manitoba's environmental standards for the development of new hog facilities are the highest of any province in Canada." (Manitoba Pork Study Committee 1994, 62)
- "The bottom line is that hog operations, by law, are not allowed to pollute. Regulations are now in place to manage the industry effectively." (Manitoba Pork Study Committee 1994, 56)

### The Farm Practices Protection Act

In 1994, the Manitoba government also proclaimed *The Farm Practices Protection Act*, which maintained the protection from nuisance suits that the previous *Nuisance Act* had given to persons carrying on agricultural operations. Under *The Farm Practices Protection Act*, certain nuisance suits could only be launched against an agricultural operation if the operation did not use normal farm practices or violated a land-use control law, *The Environment Act* and its regulations and orders, or *The Public Health Act* and its regulations and orders. Before launching a nuisance suit, a complainant would also have had to have filed a complaint with the Farm Practices Protection Board. The Board was mandated to attempt to resolve the dispute and determine if the complaint arose from a normal farm practice or not. If it was not found to be a normal practice, the Board could order the operator to cease or change the practice. The Board's decisions could be used as evidence in future nuisance cases. The Board also had the right to file its decisions in court and seek to have the courts enforce them.

### Livestock Manure and Mortalities Management Regulation: 1998

In 1998, the Manitoba government replaced the Livestock Waste Regulation with the Livestock Manure and Mortalities Management Regulation (LMMMR). This new regulation, which applied to all livestock operations, established the following additional requirements:

- Permits for construction of concrete or steel tanks for manure storage.
- Storage facilities be protected to 100-year flood level.
- Manure be applied on the basis of crop nitrogen requirements and soil texture.
- Mandatory manure management plans for operations with over 400 animal units. (See Box 7.1 for a description of manure management plans)
- No winter manure application by operations with over 400 animal units.
- Secure and frozen or refrigerated storage of mortalities.
- Mandatory reporting of manure spills.
- A 100-metre setback from watercourses for manure storage facilities and field storage.

The LMMMR contained the first requirement for manure management plans and the first limits on winter application (for operations of a certain size). The regulation gave the government the authority to require monitoring wells around manure-storage facilities. Operators were required to submit test analysis results from these wells to regional Conservation offices where they were entered in a database and tracked over time.

It was only with the introduction of the LMMMR that the government began

### Box 7.1 Manure management plans

The government monitors adherence to the LMMMR's nutrient application regulation through the use of manure management plans (MMPs). All agricultural operations with 300 or more animal units are supposed to register an annual MMP. Manitoba Conservation can apply the regulation to an operation with fewer than 300 animal units if there is reason to believe the operation's handling of manure presents a threat to the environment.

To follow manure management plans, producers must provide the nutrient content of the manure (actual or estimated); test their soil to determine its nutrient content; identify a crop with an appropriate crop-removal rate; and an application method that will ensure delivery of the appropriate nutrient levels for the chosen time of application. All of these factors can be confounded by the weather conditions at the time of application.

Manure management plans must include the type of livestock on the operation, the number of animal units per species, any increase over the previous year, the type of manure that is stored on the operation (liquid, semi-solid, or solid), the type of storage system, and the volume of manure to be applied. It must indicate whether the manure is to be treated or transferred off the farm.

The plan also has to outline the fields where the manure will be applied, their owner, the size of the fields, the soil classification, the proposed crop, the phosphorus and nitrogen soil test results, the phosphorus and nitrogen crop-removal rates, the application rate, season, start date, method of application, the amounts of non-manure phosphorus and nitrogen being applied, and the name of the applicator.

Manure management plans must be submitted before February 10 in the case of spring application and before July 10 in the case of fall application. The plan can be amended following that date as long as the appropriate application and information are provided to the government. Soil test results must be submitted prior to application and there must be verification of the spread fields required.

Manitoba Conservation can refuse to register a manure management plan if:

- The plan does not supply all required information or is not in the approved form.
- The plan has been prepared by someone who is prohibited from preparing manure management plans.
- Implementation of the plan would be likely to violate the LMMMR.
- The soil nutrient analysis is based on samples that were taken at the wrong depth or the analysis is not based on acceptable procedures.

It can also be rejected if it is submitted after the deadline and the appropriate administration fee is not submitted. Manitoba Conservation staff review each manure management plan prior to its being registered.

Manure management plans can be prepared by producers or by a person who has either completed an acceptable manure management planning course (or has what is viewed to be equivalent training or experience); is either member of the Manitoba Institute of Agrologists (or is exempt from registration with the Institute for the purposes of preparing manure management plans) or is an American Society of Agronomy certified crop adviser.

requiring inspection of manure-storage facilities. In 1998, Manitoba Environment also established its first Environmental Livestock program, which was delivered by a team of approximately eight to nine people (five fulltime equivalents).

### 7.1.3 Regulating the hog-production industry in the 21st century

#### The Livestock Stewardship Initiative and *Finding Common Ground*

In 2000, the Manitoba government announced the creation of the Livestock Stewardship Initiative (LSI). The purpose of the initiative was to ensure the sustainable development of the livestock industry in the province. In establishing the initiative, the government announced that all constructed manure-storage facilities would be inspected to ensure protection of surface and groundwater. Previously, only storage facilities constructed after 1994 were inspected.

Central to the LSI was the appointment of a Livestock Stewardship Panel consisting of Ed Tyrchniewicz, Nick Carter, and John Whitaker in 2000. At the time of the Panel's appointment, provincial hog production was 4.8 million annually, up from 3.2 million in 1996. Of these, 2.2 million (60 per cent weanlings) were being shipped to the U.S. It was expected that Maple Leaf Foods would add a second shift to its Brandon plant and Schneider Foods would expand in Winnipeg. It was estimated that to meet the increased slaughter capacity would require a $750-million investment in barns, equipment, breeding stock, and land.

The Panel held ten public meetings in June 2000 and published its report, *Finding Common Ground,* in December 2000. The report devoted considerably more attention to environmental and social issues than previous studies. For example, it dealt with nutrient levels (highlighting the need to address phosphorus levels), animal welfare, and antibiotic use, as well as the more traditional issues of manure management, odour and land-use decision-making.

While it called for a number of changes, *Finding Common Ground* concluded that the industry was, with appropriate regulation, sustainable. For example, the report states, "Compared to other jurisdictions in Canada, Manitoba's regulations and procedures appear to be of an adequate standard, although improvements are certainly possible. The overriding issue appears to be the monitoring and enforcing of these standards" (Livestock Stewardship Panel 2000, 24). *Finding Common Ground* presented approximately 40 recommendations under four main headings: 1) The role of the provincial government; 2) publicly available information; 3) intensive livestock operation (ILO) and rural development; and 4) siting decisions. The thrust of those recommendations can be summarized as follows:

1) **Role of provincial government in sustainable livestock operation:** The majority of the recommendations fell under this category. The Panel said that its overarching recommendation stressed "the need for the commitment of staff and financial resources to be devoted to two tasks: first, to gain a full understanding of the present situation of such operations in the overall milieu of agriculture in the province, and secondly, to provide a regulatory framework and a monitoring and enforcement effort in which expansion can take place without damage to Manitoba's people or environment" (Livestock Stewardship Panel 2000, 10).

2. **Publicly available information:** The Panel reported that it was "surprised at the lack of assembled information on the distribution of the livestock industry around the province." It stated that the number or location of hog barns had not been mapped against broad geographical characteristics on a province-wide basis. There was no

statistical impression of the density of large barn development (Livestock Stewardship Panel 2000, 23). The Panel favoured the establishment of an information system that would "provide Manitobans with a means for more accurately tracking the environmental effects of present and future livestock operations (as well as other industrial operations that might impact on water quality)" (Livestock Stewardship Panel 2000, 49).

3. **Role of ILOs in Rural Development:** While the Panel believed that ILOs could play an important role in rural development, there should be assistance available for farmers who do not wish to move into more intensive production. The Panel recommended what it termed a two-pronged approach in which the government developed programs to enable smaller farmers "to adjust their farming operations to a level that will provide them with an acceptable quality of life" (Livestock Stewardship Panel 2000, 11).

4. **Decision process for siting ILOs:** The Panel took the position that municipalities should provide formal assessment of new and expanding ILOs to determine if they complied with local land use by-laws, while the provincial government should assess such proposals for their environmental impact. The Panel described this as a change from the existing situation in which the province relied "on the TRC (Technical Review Committee, described in detail below) to advise the municipal council on the compatibility of the project with the environment, and the municipal council alone makes the final decision" (Livestock Stewardship Panel 2000, 37). The panel called for an expanded membership in the TRCs to include the Departments of Health and Labour. Finally, the Panel stressed on a number of occasions that the current approach did not favour large-area planning. For example, the authors noted that while it is true that Manitoba has a great deal of agricultural land, the planning process has not been able to avoid a dramatic concentration of the industry (Livestock Stewardship Panel 2000, 28).

The Commission concurs with the broad thrust of *Finding Common Ground*. That report's work and recommendations represent an important step forward in the environmental regulation of the livestock sector. The recommendations that the Commission will be making in this report reflect the *Finding Common Ground* emphasis on the need for a significant provincial role in regulating the industry, the importance of public information gathering, the need for the provincial government to take responsibility for environmental decision making, and the significance of large-area regional planning. Because the Commission is not examining the social or economic impacts of the industry, it is not pursuing the *Finding Common Ground* concern over the role of ILOs in rural development.

## Growth of the Environmental Livestock Program

Even before the *Finding Common Ground* report was released, the provincial government began to expand the Environmental Livestock program, which operated in the Department of Environment and then in Conservation. Table 7.2 summarizes the increase in resources and costs per year.

**Table 7.2: Increases in staffing and resources of the Environmental Livestock Program.**

| Year | Full-time equivalent | Budget |
|---|---|---|
| 1999-2000 | 10 | $1,035,700 |
| 2000-2001 | 5 | $1,055,700 |
| 2001-2003 | 5 | $1,443,700 |
| Total | 20 | |

*Source: Manitoba Conservation.*

Table 7.3 shows the positions that were added during this process.

## Livestock Manure and Mortalities Management Regulation Amendments 2004

In 2004, the province introduced amendments to the Livestock Manure and Mortalities Management Regulation that required:

- Registration of storage facilities without permits. This was to be completed by 2010 and pertained to earthen storage facilities constructed prior to 1994, steel or concrete tanks constructed prior to 1998, and molehills constructed prior to 1998. (Registration differs from permitting, in that a facility that was constructed under the authority of a permit would have been designed by an engineer to meet Manitoba Conservation's standards.)
- Mandatory maintenance or decommissioning of storage facilities not in use.
- Mandatory reporting of source water (the water used in the hog-operation) analyses from operations with 300 or more animal units. The operator submits these reports on the quality of the water that is used to feed their animals to Manitoba Conservation's Winnipeg office where they are entered into a database.
- That the threshold for prohibition of winter application of manure and mandatory submission of manure management plans be lowered to 300 animal units. (Operators have until 2010

**Table 7.3: Positions added to the Environmental Livestock Program.**

| Year | Position | Status | Locations |
|---|---|---|---|
| 1999-2000 | Environment Engineer (EE2) | Fulltime | Brandon |
| | Environment Officer (E02) | Fulltime | Steinbach |
| | Hydrologist (E03) | Fulltime | Winnipeg |
| | Environment Officer (E02) | Fulltime | Winkler |
| | Environment Officer (E02) | Fulltime | Steinbach |
| | Environment Officer (E02) | Fulltime | Interlake |
| | Agricultural Hydrologist (GE3) | Term | Winnipeg |
| | Aquifer Technologist (TE1) | Term | Winnipeg |
| | Agricultural Hydrologist (GE3) | Term | Winnipeg |
| | Aquifer Technologist (TE1) | Term | Winnipeg |
| 2000-2001 | Environment Officer (E02) | Fulltime | Brandon |
| | Environment Officer (E03) | Fulltime | Steinbach |
| | Environment Officer (E02) | Fulltime | Steinbach |
| | Environment Officer (E02) | Fulltime | Steinbach |
| | Environment Officer (E02) | Fulltime | Winkler |
| 2001-2002 | Manager Livestock Program (E05) | Fulltime | Winnipeg |
| | Environmental Engineer (EE3) | Fulltime | Winnipeg |
| | Clerk (CL3) | Fulltime | Winnipeg |
| | Environment Officer (E02) | Fulltime | Red River |
| | Environment Officer (E02) | Fulltime | Interlake |

*Source: Manitoba Conservation.*

to comply with the winter application prohibition.)

- That new and expanding operations be prohibited from winter application, no matter what their size.
- That commercial applicators must be certified and consultants who prepare manure management plans must be professional agrologists.
- A reduction in the rates of manure application allowable on environmentally sensitive soils. (Prior to 2004, the regulation was based on soil texture as opposed to soil agricultural capability.)
- Permits prior to the construction of confined livestock areas of 300 animal units and greater. (These include the biotech or hoop structures which had previously been exempt from permitting.)
- That there be no burning of livestock manure.

The provincial government also established the Manitoba Phosphorus Expert Committee to advise it on steps that needed to be taken to regulate the application of phosphorus in animal manure.

### Livestock Manure and Mortalities Management Regulation Amendment: 2005

In December 2005, the LMMMR was amended to require that manure management plans prepared by third parties be prepared by professional agrologists (P. Ag.) or other trained, competent professionals. This allowed certified crop advisers (CCA) as well as professional agrologists to prepare manure management plans. Both the P. Ags and the CCAs have to take a course through Assiniboine Community College. Producers may prepare their own manure management plans.

### An Examination of the Environmental Sustainability of the Hog Industry in Manitoba: 2006

The 2006 Manitoba Conservation document *An Examination of the Environmental Sustainability of the Hog Industry in Manitoba* was issued in response to the CEC's 2003 report on the Maple Leaf Foods application for expansion of its operation in Brandon. The 2003 report had called on Manitoba Conservation to work in consultation with other stakeholders to produce a study of the sustainability of hog production in the Assiniboine River basin and to develop sustainability indicators. In responding to this recommendation, the provincial government concluded that, rather than looking at the Assiniboine River basin, it would undertake a province-wide survey.

The Manitoba Conservation report provides an overview of many of the key issues relating to the hog industry's environmental impact, particularly in relation to nutrients and water quality, manure management, cumulative impacts, ground and surface water quality, siting of intensive livestock operations, and livestock pathogens. The initiatives taken by the provincial government over the past decade as part of the Livestock Stewardship Initiative are outlined and responses to the *Finding Common Ground* recommendations are briefly summarized. In some cases, the explanations are too brief; for example, the report does not make it clear that the government had chosen not to implement the *Finding Common Ground* recommendations regarding land-use decision-making.

The report surveys the various pieces of legislation that govern the livestock sector, and describes key government initiatives and programs relating to manure management, water protection, planning, farm practices, and conservation. It concludes that the required land base exists for environmentally sustainable application of livestock manure, but in some regions of the province further increases in livestock may be inappropriate if there is not enough land to handle the manure (Manitoba Government 2006).

The Commission has found the report to be a useful contribution to the Investigation that it has been mandated to undertake. The report does not, however, establish the sustainability indicators that were requested in the initial CEC recommendation nor does it investigate the full range of environmental sustainability issues that flow from *The Sustainable Development Act.*

### Manitoba Phosphorus Expert Committee: 2006

The Manitoba government appointed the Manitoba Phosphorus Expert Committee (MPEC) in 2002 to make recommendations on managing livestock manure phosphorus. The MPEC's report of 2006 recommended restrictions on the rate of manure phosphorus application, restrictions on the fall and winter application of manure, and the establishment of buffer zones in which manure application would be prohibited. The report is discussed in greater detail in Chapter 9.

### Livestock Manure and Mortalities Management Regulation: 2006 Amendments

In 2006, the LMMMR was amended to put in place manure phosphorus application-rate thresholds, further restrictions on winter and fall application, and setbacks for manure application in relation to surface water features. These regulations were based on the MPEC recommendations and public consultations, and are discussed in greater detail in Chapter 9. The threshold for construction permits for confined livestock areas for hogs (largely envirotech hoop barns) was lowered from 300 animal units to 10 animal units. In December 2006, the LMMMR was amended to put the current pause on hog production expansion into place.

### Lake Winnipeg Stewardship Board Report: 2006

The 2006 report of the Lake Winnipeg Stewardship Board (LWSB), *Reducing Nutrient Loading to Lake Winnipeg and Its Watershed*, concluded that excessive nutrient enrichment from nitrogen and phosphorus is the leading cause of a long-term deterioration in Lake Winnipeg water quality (2006). The report identified both human-activity and natural sources of nutrients. The key human-activity sources are: municipal sewage, septic fields, crop fertilizers, industrial discharges, livestock manure, and urban runoff. Natural sources include soil, the atmosphere, and decaying plant material. One sign of the impact that nutrients have had on the lake is in the increase in algal blooms. The Board's proposed plan of action included education, research, setting of long term nutrient goals, addressing transboundary issues, developing integrated watershed plans, reducing cosmetic use of phosphorus-based fertilizers, improving sewage treatment systems and water use efficiency.

The report identified eutrophication as a key problem facing the lake, noting that, when measured by levels of chlorophyll, Lake Winnipeg appears to be the most eutrophic of the world's 10 largest lakes. Over the last 30 years, phosphorus loading of Lake Winnipeg was estimated to have increased by 10 per cent and nitrogen loading by 14 per cent.

According to the Stewardship Board, agriculture has a significant impact on the water flowing to Lake Winnipeg; of the 55-million hectares of the Canadian prairie farmland in the Lake Winnipeg drainage basin, half is under crop production. The Winnipeg, Red, and Saskatchewan Rivers account for 82 per cent of the mean monthly flow into Lake Winnipeg. In recent years, flow from the Saskatchewan River (which is low in nutrient content) has been declining, while flows from the Red (which is higher in nutrient content) have been increasing. Spring runoff is a major contributor to the flow to the lake: according to one study, cited by the LWSB, snowmelt runoff constitutes 85 per cent of total annual runoff from Western Canadian agricultural watersheds.

The Red River, which has only 11 percent of the flow to the Lake Winnipeg, supplies 54 per cent of the phosphorus and 30 per cent of the nitrogen. The high fertility of Red River Valley soil and the extent of development in the valley are cited as the reasons behind the high nutrient content of the flow in the Red River. The dominant form and process of phosphorus loading appears to be dissolved phosphorus during the spring runoff (rates are highest in April and May). Fifty-one per cent of the nitrogen and 53 per cent of the phosphorus originates in the United States, underscoring the need to develop a cooperative, international approach to loading reduction.

The Lake Winnipeg Stewardship report concluded that Manitoba agriculture is the source of 1,200 tonnes of phosphorus and 5,100 tonnes of nitrogen entering the lake each year. This amounts to 15 per cent of the total phosphorus load (32 per cent of Manitoba's phosphorus contribution) and 5 per cent of the total nitrogen load (11 per cent of Manitoba's nitrogen contribution) (Lake Winnipeg Stewardship Board 2006, 25-26).

The report called on the Manitoba government to adopt the MPEC recommendations and to support research that will help to further refine soil-phosphorus thresholds for varying Manitoba soil types and landscapes. It also recommended the development of a terrestrial nutrient budget for Manitoba that considers all agricultural nutrient sources and nutrient exports. It recommended that the proponents of new and expanding livestock operations be required to demonstrate that they have sufficient land available to balance phosphorus application rates with removal rates over the long-term.

## 7.2 Land-use decision-making

Manitoba law has traditionally taken the approach that land-use planning is a local responsibility. Zoning bylaws, which outline activities that can and cannot be undertaken in different areas of a municipality, are seen as the appropriate planning instruments. Historically, zoning bylaws were voluntary and many municipalities, particularly smaller rural municipalities, did not adopt them. Those rural municipalities that did adopt zoning bylaws usually addressed the issue of the siting of livestock operations by stating that such operations were conditional uses under the bylaw. Under this approach, the local council had to grant the proponent of a livestock operation a conditional-use permit before a livestock operation could be established or expanded. As late as 2000, 12 rural municipalities had no zoning bylaw to regulate siting and development of livestock operations. In isolated cases, municipalities that did not have zoning bylaws were able to regulate the industry under provisions of *The Municipal Act* granting the municipalities authority to pass bylaws dealing with such issues as safety, health, protection and well-being of people, and the right to regulate activities that could give rise to nuisance complaints.

After 1994, the provincial government required that, in cases where the municipality had a zoning bylaw in place, the proponent of a livestock operation had to have all necessary municipal approvals (usually a conditional-use permit if the operation was above a specified size) before it would grant the proponent a manure-storage-facility permit. It was only after both permits were received that construction of the project could commence. (In the early part of the current decade, a government legal opinion concluded that the department had to issue a permit as long as the applicant met the requirements of the LMMMR. However, according to Manitoba Conservation, no permits were issued unless the necessary municipal approvals had been received by the proponent.)

The role that municipalities play in the approval of intensive livestock operations became increasingly controversial over the past two decades. As early as 1994, in its report, the Manitoba Pork Study Committee noted:

> Rural Municipal Councils have found themselves in the centre of these disputes, without adequate information with which to make an informed decision or an appropriate process to resolve basic disagreements. This situation places undue pressure on all parties and must not continue because it fails to adequately address and balance both the environmental risks and the potential economic benefits of hog projects for all Manitobans. (Manitoba Pork Study Committee 1994, 56)

In some cases, industry proponents argued that the conditional-use system was being abused by councillors, who were being stampeded by small, but vocal, groups of hog industry opponents. They believed that councils put unrealistic restrictions on some developments (in terms of distances from other properties, requirements to cover manure-storage facilities, and requirements to inject or incorporate manure) and, in other cases, rejected proposals that met all the appropriate environmental and land-use regulations. Others believed that municipal councillors had fallen under the sway of proponents and the provincial government, which they viewed as an active promoter of the hog industry, and as a result, failed to enforce municipal regulations and allowed development to take place in the face of local opposition. As a rule, the provincial government does not initiate any form of legal action against municipalities that do not abide by *The Planning Act*. Instead, the provincial policy has been to draw the fact to the municipality's attention that its action is not in accordance with the Act and could leave the municipality open to a legal challenge. The municipalities are legal corporate entities that are liable for their own actions.

### 7.2.1 *The Planning Act*

The provincial *Planning Act* sets out the framework for Manitoba zoning law, including the legal requirements that must be met to adopt a bylaw. It is administered by The Department of Intergovernmental Affairs.

*The Planning Act* allows municipalities to establish development plans that would work within a set of provincial land-use policies (PLUPs). The intent has been to develop future-oriented development plans that would be supplemented by zoning bylaws. Development plans were essentially municipal bylaws: the plans that were initially adopted usually did not deal with intensive livestock operations in detail, simply stating that large-scale livestock operations would be viewed as requiring conditional-use permits. *The Planning Act* also created the possibility of municipalities joining together to establish planning districts. PLUPs were first established in 1980 as *Planning Act* regulations intended to serve as guidelines in the development of municipal development plans.

In response to the controversies that arose at the municipal level over the approval of hog-production facilities, *The Planning Act* underwent a number of changes.

### 7.2.2 *The Planning Act* amendments: 2000

In 2000, *The Planning Act* was amended to make Technical Review Committee (TRC) reports mandatory prior to the consideration of an application for a conditional-use permit for a livestock operations of 400 or more animal units (this applied only in those municipalities that had adopted a zoning bylaw). The Manitoba government had established regional Technical Review Committees in 1994 to evaluate new farm operations in light of the *Farm Practices Guidelines*. Made up of representatives from Agriculture, Rural Development, Natural Resources, and Environment, the committee's role was to "evaluate a project or projects on behalf of hog farmers and rural municipalities to help maintain good environmental practices for farming operations" (Manitoba Pork Study Committee 1994, 56). According to the discussion paper prepared for the 2000 Livestock Stewardship Initiative consultation, TRCs were expected to provide local governments with evaluations of proposals for new or expanding operations and to assist in the exchange of information between the proponent, local government and rural residents (Manitoba Government 2000a).

The 2000 amendments to *The Planning Act* also required that residents who lived within two kilometres of a proposed ILO be given notice of the local conditional-use hearing (previously notice had been required for residents who lived within 100 metres of the proposal). Again, the provision only applied in those municipalities that had adopted zoning bylaws.

### 7.2.3 *The Planning Act*: 2006

Conflicts over approvals of livestock operations (mainly hog-production operations) continued into the new century. Amendments to *The Planning Act* were proposed but subsequently withdrawn in 2004. In 2005 a new *Planning Act* was adopted, coming into force in 2006. It sought to provide the industry with greater predictability, while allowing municipalities to retain their ability to approve or reject proposals. The 2006 *Planning Act* contained a number of important conditions specific to livestock operations and intensive livestock operations in particular. Under the Act, municipalities and planning districts are required to:

- **Adopt a development plan and a zoning bylaw by January 1, 2008.** The plan can only be adopted after the municipality or planning district holds a public hearing on the proposed plan. While a zoning bylaw does not require provincial approval, a development plan must be submitted to the province. Before the municipality or planning district can adopt the plan, it must receive the approval of the Minister of Intergovernmental Affairs. The minister can refer objections to the plan to the Municipal Board, which must then hold a hearing on the plan. The Minister can chose to either accept the bylaw, reject the bylaw, or approve it subject to the municipality or planning district making any alterations required by the minister or complying with any condition imposed by the minister. The municipality or planning district can either choose to adopt the plan (along with any alterations or conditions required by the minister) or pass a motion not to proceed with the plan). After consulting with a municipality or planning district the minister may order it to adopt a development plan. If the municipality fails to comply with such an order the minister may prepare a development plan. Before imposing this plan on the municipality or planning district, the minister may seek the advice of the Municipal Board on the plan.

The adoption of a new development plan must be preceded by public hearings. The development plan must be generally consistent with provincial land use policies. Once approved, it replaces the PLUPs for that municipality or planning district and all departments and agencies rely on the development plan policies to guide their recommendations and decisions.

The minister has the authority to grant exemptions to the deadline for adopting development plans. The Commission has been informed that such exemptions have been granted in response to requests from a number of municipalities and planning districts.

- **Incorporate a livestock operation policy into new or existing development plans by January 1, 2008.** The livestock operations policy must set out:

  (i) Areas where the expansion or development of livestock operations of any size may be allowed.
  (ii) Areas where the expansion or development of livestock operations involving a specified maximum number of animal units may be allowed.
  (iii) Areas where the expansion or development of livestock operations will not be allowed.

  It must also set out the general standards to be followed respecting the siting and setback of livestock operations. The plan must provide reasons for the restrictions or prohibitions on livestock operations. Furthermore, the reasons must draw on the following factors:

  (a) soils;
  (b) the size of a livestock operation, based on the number of animal units in the operation;
  (c) proximity to significant surface water bodies, such as lakes, rivers and wetlands;
  (d) flood risk areas identified by the province;
  (e) groundwater vulnerability areas identified by the province;
  (f) proximity to areas designated in the development plan as
  (i) urban centres or settlement centres,
  (ii) rural residential or seasonal residential areas, and
  (iii) parks or recreational areas; and
  (g) existing land uses in the area.

- **Adopt siting and setback regulations in their zoning bylaw that were no less stringent than the siting and setback standards established by regulation in the Manitoba Provincial Land Use Policy for agriculture.**

- **Make livestock operations of over 300 animal units mandatory conditional-use operations.** If the municipality does not have a zoning bylaw, the provincial government will require that the municipality hold a conditional-use hearing into the project. The province will not provide manure-storage permits to operations of over 300 animal units if they do not have conditional-use permits.

- **Provide notice to residents within three kilometres of a proposed livestock operation involving 300 or more animal units of a public hearing into the proposal.** There is also a requirement that the meeting be advertised in the newspaper and that the property be posted.

In the case of operations of 300 or more animal units, the initiating step for the conditional-use permitting process under *The Planning Act* is the proponent's request to the municipality or planning district for a permit. The municipality forwards that request to the provincial government, which, in turn, refers the request to the appropriate TRC.

*The Planning Act* requires that TRC reports be provided to the appropriate planning district board, municipal council or planning commission, and that the appropriate planning authority make the report available to the public. The legislation does not outline the TRC's range of inquiry or method of operation. There are three regional TRCs, with representation from Manitoba Agriculture, Food and Rural Initiatives (MAFRI), Intergovernmental Affairs, Water Stewardship, and Manitoba Conservation. They also have the authority to include representatives from other departments with interest in the project. The director of the MAFRI Land Use Branch (or designate) chairs the TRCs. The reports are expected to look at cumulative impacts in terms of assimilative capacity of the land base of the proposed facility, and neighbouring livestock operations (within a two-kilometer radius) to utilize livestock manure on a sustainable basis as a crop nutrient (Manitoba Government 2000b). While the Manitoba government seeks to complete the TRC report within 60 days of receiving all the necessary information, in 2006, the average completion period was 104 days.

The council is required to give public notice of a public hearing that is to be held at least 30 days after it receives the TRC report. A representative of the TRC (not all TRC members) must be present at the public meeting where the TRC report and the proposal are discussed. The council can then decide to reject, approve, or approve the proposal with conditions. More specifically, the Act states the Council can only approve if:

(i) the Technical Review Committee has determined, based on the available information, that the proposed operation will not create a risk to health, safety or the environment, or that any risk can be minimized through the use of appropriate practices, measures and safeguards, and

(ii) the proposed operation
  A) will be compatible with the general nature of the surrounding area,
  B) will not be detrimental to the health or general welfare of people living or working in the surrounding area, or negatively affect other properties or potential development in the surrounding area, and
  C) is generally consistent with the applicable provisions of the development plan by-law, the zoning by-law and any secondary plan by-law.

The implication of section (i) is that the Council cannot approve in the face of a TRC finding that the operation constitutes a risk to health, safety, or the environment. If it approves the project, the council can only impose the following conditions, which, the Act states must be "relevant and reasonable":

(a) measures to ensure conformity with the applicable provisions of the development plan by-law, the zoning by-law and any secondary plan by-law;

(b) measures to implement recommendations made by the Technical Review Committee;

(c) one or both of the following measures intended to reduce odours from the livestock operation:
  (i) requiring covers on manure-storage facilities,
  (ii) requiring shelterbelts to be established;

(d) requiring the owner of the affected property to enter into a development agreement.

The Act also states that the only restrictions that a conditional-use permit can place on an operation "respecting the storage, application, transport or use of manure," relate to the covering of storage facilities and requiring shelterbelts.

The conditional-use permit is valid for 12 months, although it may be extended for an additional 12 months. During the eight-year period from 1998 to 2005, 14 per cent of the projects that were proposed and reviewed by TRCs were not approved by councils. Because TRC reviews have only been required for assessments of operations above a set size (initially 400 animal units, now 300 animal units), this does not account for all the projects that came before municipal councils during that period.

## 7.3 The role of Manitoba Agriculture, Food and Rural Initiatives

A key element in the mandate of Manitoba Agriculture, Food, and Rural Initiatives (MAFRI) is to assist in the economic development of the agriculture sector. In that sense, its focus is on promotion, education, and outreach as opposed to the regulation of agricultural producers. Agronomic and environmental issues are however closely intertwined, and a number of MAFRI initiatives have a clear and important environmental focus. The clearest example of this focus is the Agri-Environment Knowledge Centre.

### 7.3.1 The Agri-Environment Knowledge Centre

The Agri-Environment Knowledge Center provides services addressing agricultural environmental issues. It assists in the delivery of the Environmental Farm Plan (EFP) program by reviewing and editing the EFP workbook, developing a workshop format, and reviewing and recommending appropriate beneficial management practices (BMPs). It also assisted in the development of the Farm Stewardship Association of Manitoba review process for the EFP. (See Box 7.2 for more on the Environmental Farm Program.)

Centre staff also coordinated the 2007 edition of the *Farm Practices Guidelines for Pig Producers*, a volume that had not been

### Box 7.2 Environmental Farm Plan Program

The Environmental Farm Plan Program was introduced in Manitoba as part of the federal-provincial Agricultural Policy Framework. It is accompanied by the Canada-Manitoba Farm Stewardship Program (CMFSP), which provides financial and technical support to producers to implement environmentally beneficial actions identified in their Environmental Farm Plans. When it was initially announced in 2005, the federal government committed $30-million to the program in Manitoba, while the provincial government committed itself to more than $10.4-million of in-kind support. The Manitoba support was for workshops and technical support to producers in the development and implementation of Environmental Farm Plans. The program, currently set to run to March 2008, should be renewed into the future.

The Farm Stewardship Association of Manitoba (FSAM), a non-profit organization, assists in the delivery of the program in partnership with the federal and provincial government.

Farmers who participate in the program attend a series of workshops coordinated by the FSAM at which they receive training in identifying environmental issues on their farm and techniques that can be used to manage those issues. Based on this training, the farmers develop Environmental Farm plans that are reviewed by FSAM. Once the plan has been successfully reviewed, producers are eligible for assistance from the Canada-Manitoba Farm Stewardship Program to implement environmental practices identified in their plans. Producers can receive between 30 to 50 per cent of the cost of implementing the plan up to a maximum of $50,000. The plans include funding for such programs as:

- Manure management.
- Relocation of livestock confinement facilities.
- Product and waste management.
- Water well management.
- Riparian protection.
- Integrated pest management.
- Shelterbelt development.
- Biodiversity enhancements.
- Grazing strategies.

updated since 1998. The Guide is a valuable set of guidelines for hog production that helps local governments evaluate hog-production proposals and assists producers in operating in a way that makes the maximum use of manure while mitigating odour and environmental impacts. They also participated in the Technical Review Committees. In response to the development of the new restrictions on phosphorus application, staff were engaged in a variety of extension education activities, including presentations to agronomists (particularly through the Crop Diagnostic School), reprogramming the Manure Application Rate Calculator, revising the Farm Practices guidelines, revising the Manitoba Environmental Farm Plan, and contributing to course manual development for training manure-management planners and custom-manure applicators. The Manure Application Rate Calculator is a piece of computer software that assists producers in developing manure management plans.

The Centre staff are also involved in developing strategies to

- Adapt to climate change.
- Reduce off-farm energy requirements.
- Rehabilitate soils.
- Reduce the impacts of odours.
- Improve water management.
- Ensure the management of the entire agricultural landscapes including such broader riparian areas and cropped uplands.
- Protect ecological goods and services.

### 7.3.2 Covering New Ground (The Agricultural Sustainability Initiative)

The Agri-Environment Knowledge Centre also administers the provincial Covering New Ground program (also known as The Agricultural Sustainability Initiative). Covering New Ground is a provincial government program that provides funding and technical help to producer groups and commodity organizations that are developing pilot projects that address environmental agriculture issues. Established in 1998, it has provided funding to over 1,000 projects. In relation to the hog industry, it has sponsored projects that address ways of controlling phosphorus loss through BMPs.

Agri-Environment Knowledge Centre staff are also involved in soil assessment and analysis work for a range of agronomic and environmental purposes in the province's integrated watershed planning that is led by

### Box 7.3 Environmental goods and services

In 2005, a pilot Alternative Land Use Services (ALUS) program was established in the RM of Blanshard. The project was developed by the Keystone Agricultural Producers and is administered by the Manitoba Agricultural Services Corporation. The program provides producers with a small payment for providing ecological services that provide environmental benefits to the public-at-large from resources on private land. It received funding from the federal and provincial government, the Delta Waterfowl Foundation, the Manitoba Rural Adaptation Council, and the RM of Blanshard. The program provides farmers and landowners with a financial incentive to maintain and enhance wetlands, ecologically sensitive lands, riparian areas and natural areas. The payments vary on the service being provided. Approximately 20,000 acres are enrolled in the ALUS program to date (Grier et al. 2007).

the Manitoba Water Stewardship. Through its Livestock Stewardship Initiative, it recently helped sponsor the trial use of a centrifugal manure separator in Manitoba. The Agri-Environment Knowledge Centre also helped sponsor the Manitoba Alternative Land Use Initiative, started in 2005 and intended to promote the delivery of Environmental Goods and Services. (See Box 7.3).

MAFRI's Livestock Knowledge Centre also provides producers with advice in regards to production-related nutrient issues such as feed composition. Engineers on staff with the department also assist with questions regarding manure-storage facilities.

## 7.4 Controlling nutrients

Producers can and are taking a number of steps to improve their control over nutrients. In so doing, they are becoming more efficient and increasing the environmental sustainability of their operation. This section is meant to bring together issues that are addressed separately in this report and identify some of the measures that producers are taking. There are several important points at which producers can exercise considerable control over nutrient loss. These are:

- Feed composition.
- Feeding strategies.
- Manure storage.
- Manure application.
- Beneficial practices

### Feed composition

A key step in this management process involves managing the nutrients that are brought onto the farm. Phosphorus levels in hog manure are elevated because most of the phosphorus present in the grains (and in the grain components of pelleted feed) is in the form of phytic acid. Monogastric animals cannot digest phytic acid and, as a result, the hogs excrete this phosphorus. In barley, 75 per cent of the phosphorus is in the form of phytate, which means the animal simply passes most of the phosphorus through its system. In order to ensure that hogs receive sufficient phosphorus, it has been necessary for producers to add dicalcium phosphate to the feed. Pound for pound this is one of the most expensive feed additives. Over the past decade phytase, an enzyme that allows hogs to digest phytic acid has been marketed to the hog industry. To the degree that operators use this additive, they are able to increase the amount of phytic acid phosphorus the hog absorbs. This allows them to reduce the amount of dicalcium phosphate added to the feed and to reduce the total amount of phosphorus in the feed, thus reducing the total amount of phosphorus that is excreted.

The Commission has been told that many producers are now adding phytase to their feed mix. However, the environmental benefit of adding phytase will not be felt unless producers make corresponding reductions in the addition of dicalcium phosphorus. Most producers did not start adding phytase until 2002. The Manitoba Pork Council told the Commission that phytase is added to the diets of 60 per cent of all Manitoba hogs.

Producers are not able to take full advantage of the benefits of phytase due to federal regulations that mandate a specific level of phosphorus in animal feed. The Canadian Food Inspection Agency (CFIA), under the authority of the federal *Feeds Act* evaluates and approves ingredients for use in livestock feeds. The Feeds Regulation under this Act sets out, on a species-by-species basis, minimum and maximum levels of nutrient in feeds. The regulation, which has not been amended since 1983, was developed well before producers began adding phytase to hog rations. The amount of phosphorus that it requires to be added to hog feed is based on the assumption that most of the phosphorus will not be available to the hog.

While the current regulation provides feed companies and producers with some room to maneuver, the full environmental benefits of phytase will not be achieved until the federal government revises this regulation. The Commission encourages the provincial government to work with the federal government to remove barriers to further feed efficiencies by modifying the Feeds Regulation to reflect industry and research developments of the past quarter century. The Commission also urges feed companies to develop more efficient feed mixes (more phytase, less dicalcium phosphate).

A related issue has arisen in Saskatchewan where researchers have developed a strain of barley that is lower in phytate and higher in available phosphorus. The researchers have not been able to register the barley as a feed because of a conflict with the CFIA over the registration category. While the Commission has not investigated this case in full (in which the CFIA wishes to register the barley as a novel strain, while the academic researchers who developed it believe this is an inappropriate designation that will also serve as a barrier to its use), it encourages the provincial government to work with the federal government to ensure that environmentally friendly feeds are available to producers.

### Feeding strategies

Hogs require different levels of nutrients depending on their age and their stage in development. Many producers have adopted split-sex feeding and phase feeding strategies. These strategies can reduce the nutrient content of manure. The Commission was told that many producers employ both of these feeding practices. The large producers indicated that these practices were common on their farms.

### Manure storage

Nitrogen can be lost to the atmosphere when manure is stored in uncovered manure-storage facilities. Synthetic covers are most effective, but are much more expensive than the more commonly used barley straw covers that are blown on the surface of the manure-storage facility. The Manitoba Pork Council told the Commission that 15 to 20 per cent of the manure produced in Manitoba is protected by covers. Elite Swine told the Commission that it had 20 sites with straw covers and 13 sites with synthetic covers. The Puratone Company told the Commission it was working with a company called AgCert that would cover manure-storage facilities as part of an agreement to sell certified emission credits on an international exchange.

In Manitoba, operators store manure in both one-and two-cell manure-storage facilities. With the two-cell system, the manure goes into a primary cell, in which the solid fraction settles out from the liquid. The liquid is then moved into the secondary cell. The manure that is applied from the secondary cell will have a lower phosphorus content and not need to be agitated before being pumped out of the cell.

### Manure application

There are two important steps in applying manure appropriately. The first involves determining the appropriate amount of manure that should be applied; the second involves the method of application.

To determine the appropriate rate at which manure is to be applied, the producer must develop a manure management plan as described in Box 7.1. This process involves both manure and soil testing, both of which give producers valuable information in controlling the movement of nutrients.

The injection or incorporation of manure dramatically reduces nutrient loss to the atmosphere and reduces odour concerns. Injection or incorporation is used on over 80 per cent of the land on which the predominant hog producers apply liquid manure. The Manitoba Pork Council told the Commission that between 70 to 80 per cent of Manitoba manure is injected.

The timing of manure application also has an impact on controlling nutrients. The Manitoba Pork Council stated that the industry is moving towards the ending of all winter spreading. However, most application takes place in the fall as opposed the spring, which is the optimal time in terms of controlling nutrient loss.

Aside from the above methods, a variety of cropping, tillage, and soil management methods can also be used to address the issue of manure movement from fields to ground and surface water. However, the most effective measures are those that can assure the appropriate amounts of nutrients are applied in the correct ratios.

### Separation and treatment

All of the above methods might be termed soft methods for nutrient control. If producers find that, after investigating or employing these methods they are still not able to bring the nutrient budget into balance, it may be necessary to move to some form of manure separation or treatment. While the technologies are not widely used in Canada, they are employed in other jurisdictions. However, issues of climate and geographic concentration could play a role in limiting the applicability of some of these technologies. The Manitoba government has, in recent, years been assisting producers in exploring the potential of centrifugal separation and anaerobic digestion. With use of the centrifuge, the solids and liquids in manure are separated, the phosphorus largely settles out in the solid portion, while the nitrogen remains in the liquid portion. The nitrogen and phosphorus ratio in the liquid portion more closely approximates the crop-removal rates for both nutrients, making it possible to apply liquid to fields in an economic manner. The solid portion is easily composted and economically transported and serves as a valuable phosphorus fertilizer.

The anaerobic digestion of manure has been seen as a potential treatment process for hog manure. It is thought that it could serve to produce energy, reduce odour, and concentrate phosphorus so that it can be economically transported. It remains an expensive technology, which is not easily adapted in an economic fashion to Manitoba's climate, particularly in light of the low energy costs in the province.

The hog industry has contributed to improvements in the environmental operation of the industry in a number of ways. For example, the Canadian Pork Council developed the Canadian Code of Practice for Environmentally Sound Hog production. It stresses environmentally sound manure management with attention to long-term manure storage, incorporation of manure below the soil surface prevention of water contamination, odour control, manure application rates, and adequate land for application (Holley et al. 2007). It also notes that Manitoba Conservation and Manitoba Agriculture, Food and Rural Initiatives (MAFRI) staff continue to play an important role in their work with producers to help the industry develop more sustainable nutrient management practices.

Finally, the Commission supports the Lake Winnipeg Stewardship Board recommendation that the federal and provincial governments support research into beneficial management practices and fund the implementation of effective practices.

**Box 7.4 Other jurisdictions**

As a part of its terms of reference, the Commission was instructed to "take into account the efforts underway in other jurisdictions to manage hog production in a sustainable manner." The Commission has addressed this requirement in a number of ways. As a part of its work, the Commission reviewed studies on global trends in environmental regulation of the industry from a global perspective (Oenema 2004; Steinfeld et al. 2006). These studies confirmed for the Commission that *The Sustainable Development Act* and its principles and guidelines provided an appropriate set of criteria for assessing the environmental sustainability of the hog production industry.

The Commission also commissioned a range of research papers, each investigating a different aspect of the hog-production industry. The authors of these papers were requested to include discussions of how other jurisdictions handle environmental issues. These papers were posted on the Commission website and made available to the public during the hearing process. The Commission encourages policy makers and members of the broader public to review these reports.

In the following chapters of this report, the Commission assesses the barriers to the sustainability of hog production in Manitoba and the associated provincial government environmental policies. In reaching its conclusions and formulating its recommendations, the Commission took into consideration the approaches developed in various jurisdictions. It has, however, not adopted a checklist and scorecard approach to this issue, nor is it prepared to make comparative judgments as to whether or not Manitoba has or does not have the strongest (or weakest) regulations. Legislation and regulation constitute only a portion of any jurisdiction's response to environmental issues: issues that are not dealt with in regulation may, for example, be adequately dealt with by policy. Nor is the stringency of a regulation necessarily an appropriate measure of its effectiveness. There also remains the question of compliance and enforcement: if regulations do not have legitimacy in the community and an adequate enforcement regime, they will have little impact. An assessment as to which jurisdiction has the best regulatory approach can only be the result of detailed comparative studies of all the components of a regulatory regime.

Comparison of agricultural regulations is further clouded by the very nature of agricultural activity. Agriculture takes place in a diverse, complex, highly variable, and unpredictable environment. Most command-and-control regulatory approaches work best when dealing with uniform conditions. The best regulatory measures will be developed to meet the specific conditions of a specific jurisdiction—which means that they may or may not be the best approaches for Manitoba.

Through its work the Commission has identified the following regulatory tools:

- Seasons when application of manure and fertilizer should be restricted or banned.
- Regulations on how manure is to be applied (for example, requirements for injection or incorporation, bans on surface application).
- Setbacks for odour control.
- Setback to protect water quality.
- Licensing of water withdrawal.
- Permitting requirements for manure-storage facilities.

- Manure management plans with required soil and manure tests.
- Water -quality monitoring.
- Phosphorus and nitrogen application limits based on crop uptake.
- Emission regulations and controls (for example, covers for manure-storage facilities).
- Training and licensing requirements.
- Requirement for municipal approval prior to construction of intensive livestock operations.
- Requirements for animal space.
- Requirements for manure processing.
- Identification of ecologically sensitive and vulnerable zones.
- Public input into decision making and public access to information.
- Manure storage capacity requirements.
- Prohibitions on the discharge of manure.
- Farm budgeting of nutrients.
- Regulations on feed content.
- Regulation on the disposal of mortalities.
- Regional watershed based decision-making and planning.
- Animal disease surveillance programs (particularly those diseases that can spread to humans).
- Antibiotic resistance surveillance programs.
- Incentive programs to encourage the adoption of environmentally friendly practices.

This list is not exhaustive, but does give a sense of the range of issues that jurisdictions are addressing. In some areas, Manitoba has had regulations in place for over a decade, in other instances, provincial regulation is more recent, and in other cases, there is need for new initiatives. In many cases, it would appear that the Manitoba regulations are amongst the strongest, particularly if one restricts the comparison to North America. In the end, the Commission is less interested in determining which jurisdiction has the strongest paper regulation, but whether Manitoba has the appropriate regulations.

On a concluding note, a number of observations can be made about the history of the regulation of livestock in developed countries that may provide some insight into the tensions that agricultural environmental regulation gives rise to.

- Most governments have been hesitant to extend environmental regulation to agriculture, since the countryside has traditionally been seen as a repository of virtue and health. When problems began to be identified in the 1970s, reluctance to embrace environmental policies that could lead to a reduction in livestock numbers or concentration led many governments (particularly those with highly developed livestock sectors) to place their faith in technological innovation.
- Environmental impacts of agricultural practices can be very slow to develop—and the impacts can develop away from the farm site, and even away from the region in which agricultural operations are located. By the time the impacts are identified, the agricultural practices that

contributed to them (and it is usually the case that agriculture is not the only contributor and not the sole cause) have become standard practice, and may well be seen as economically necessary for the survival of the sector. Environmental mitigation measures, while expensive, may be of limited impact, particularly in the short term, further undermining the legitimacy of such measures.

- There exists a tension between what are described as command-and-control models (that depend on regulation and enforcement) versus incentive or stimulation models (that depend more on reward and education). It should be noted that these are not necessarily mutually exclusive models. If they are not properly integrated however, farmers as a class can feel criminalized and appropriate practices may not be adopted.
- Agriculture is an extremely expensive sector of the economy to regulate. Furthermore, many aspects of agricultural operations are very difficult to regulate with precision.
- Environmental policy usually includes a commitment to the polluter pay principle, with the goal of having many environmental costs that are currently externalities, internalized by producers. While in some cases, the process of internalization will lead to the adoption of increasingly efficient practices that will reduce the regulatory cost, there is no doubt that environmental regulations have increased the cost of raising livestock. At the same time, governments have been faced with increased costs in both regulating the industry and in assisting producers in adopting new techniques.
- Once policies are put in place, it is likely that there will be continued adjustments.
- In many jurisdictions, there have been conflicts not only between farmers and environmentalists over the relationship between the environment and agriculture, but also been within government between departments charged with promoting agriculture and protecting the environment (Bureau d'audiences publiques sur l'environnement. 2004; Grier et al. 2007; Oenema and Berentsen 2005; Steinfeld et al. 2006).

# 8 Public Input

Public participation is a key element in the ongoing work of the Clean Environment Commission. Because of the broad range of issues associated with the environmental sustainability of the hog-production industry in Manitoba, the Commission held two separate sets of public meetings. At the first set, held in January 2007 in three locations in agro-Manitoba, members of the public were invited to provide input as to what they believed should be included in the scope of the Commission Investigation. The second set was held in March and April 2007. Over a period of 17 days, 188 people made presentations in 14 locations. (See appendices for a list of presenters and locations.) While presenters were requested to limit their presentations to fifteen minutes, individuals and organizations were able to make longer presentations if they had made prior arrangement with the Commission. All of the presentations were transcribed and were posted on the Commission's website (www.cecmanitoba.ca). The Commission also received 50 written submissions, which were also posted on the Commission website. In addition, the Commission engaged a researcher to meet with individuals who wished to discuss the industry in a less public forum. A report based on these interviews has been prepared and was made available on the Commission website (Irwin 2007).

The following is a summary of key points made during the meetings, in the submissions, and in the private sessions, arranged by the subject headings that the Commission identified through the scoping process.

## 8.1 Nutrient management

There were three essential, and conflicting, opinions presented on the proposed phosphorus regulation. The first was that the regulation is sufficient to address the issue of phosphorus accumulation in soils from the application of livestock manure and that most producers would be able to conform to the regulations. In parts of Western Manitoba, the Commission was told that soil is so deficient in phosphorus that the regulation will present little if any burden to producers. A second opinion was that the regulation constitutes a significant financial burden, particularly for small producers. It was suggested that in some areas it could double the cost of pumping manure to fields. Those who took this position argued for financial assistance for producers who must incur additional costs to comply with the regulation. In southeastern Manitoba, it was stated that some producers are going to have to clear additional land to meet the regulatory requirements. Many small producers will also be obliged to build manure-storage facilities when winter application is banned in the Red River Valley Special Management Area. The third position was that the regulation, which under certain circumstances allows phosphorus to be applied at rates that exceed crop-removal rates, would do nothing to reduce nutrient loading and amounts to a license to pollute. These critics often held that thresholds should be based on the ability of crops to use nutrients, should consider residual nutrients applied in previous years, and should not be based on the holding capacity of the soil.

Several presenters stressed that the phosphorus surplus issue should be dealt with on a regional or site-specific basis, integrating good economic farm management.

Others raised questions about the sources of nutrients in Manitoba waterways. They indicated that some studies suggested the sources of these nutrients could be natural processes or crop production rather than livestock, and noted that there will be little producer participation in government-promoted beneficial management practices programs unless producers believe the practices are relevant to local conditions. These presenters often called for further research into nutrient transport mechanisms from soil to water.

The Commission heard considerable evidence on the measures that producers take to control the nutrient content of hog manure. These include feed formulations (decreasing the amount of nutrients in the ration and utilizing amino acids), the use of phytase (an enzyme that increases the animal's ability to access phosphate in feed), phase feeding (changing the feed mix for hogs depending on their age), and split-sex feeding (feeding male and female pigs different feed mixes). Producers stated the province could assist them by encouraging federal regulators to lower the required phosphate level in hog rations in light of the use of phytase and to allow for the feed-grain registration of grains that are low in phytate (the use of these grains would lead to a decrease in the amount of phosphorus the animal excrete).

Beyond these points of view, there were concerns that the government has introduced so many regulations, and changed them with such frequency, that it is not possible to examine their effectiveness.

Critics of the industry regularly suggested that there was not enough monitoring and inspecting of the hog-production industry. This criticism was raised in relation to numerous issues, including nutrient management, soil testing, manure application, and storage-system operation. It was also argued that the fines for those who were prosecuted for violations of the regulations were not a sufficient deterrent. It should be noted that industry representatives also called for increased enforcement and auditing of manure management plans.

Concerns that regulations were not enforced were balanced by views that took the position that regulation threatened the viability of many small operations. The Commission was told that it should consider ways of reaching goals through incentives rather than regulation. In the case of regulations intended to protect the general environment, it was suggested that the public at large bear a portion of the costs generated by these regulations.

## 8.2 Manure management

The key concern with manure management was whether manure, which might contain pathogens, growth hormones, antibiotics, chemical disinfectants, heavy metals, and excessive amounts of nitrogen and phosphorus, either leaks or escapes from barns and storage facilities or is spread in a way that threatens the environment.

It was stressed that manure contains many important nutrients not found in synthetic fertilizers. Furthermore, the majority of pigs on farms at any one time are weanlings, who produce very little manure. It was estimated that the hog industry only produces enough manure to cover 15 per cent of total provincial cropland using the phosphorus regulations. Properly handled, it was not a waste, but an asset.

Manure is usually applied by professional applicators according to manure management plans, often completed by professional agrologists, that must be registered with the provincial government. The applicators make use of global positioning technology, auto-steer, and flow meters. Changes in technology have meant that the pumping distance had grown steadily over the past three years and the average distance from storage unit to field for professional applicators was three kilometres. Numerous producers employ a variety of technologies to separate the solids and liquids in manure, reduce odour, and create valuable dry manure.

Other presenters noted that in the past livestock producers had applied manure as a soil amendment to meet agronomic needs. Now it was being applied to meet the waste management needs of industrial hog barns at rates that exceeded crop uptake. There was also concern that in some locations liquefied manure is being spread on marginal land and cattle pasture without being incorporated into the soil. Where there are conduits from the surface to the aquifer, this represents a potential environmental threat.

It was generally recognized that the winter application of manure on fields is not environmentally desirable and many presenters called on the Commission to recommend a complete ban on the practice. Small producers indicated that such a ban would likely force them to cease production. For this reason, there were recommendations that any ban on winter application be accompanied by financial assistance that would allow producers to develop alternate storage systems.

Presenters also suggested that bans be placed on the application of manure in the fall, in ecologically sensitive areas, and on the same plot of land on a regular basis.

Injection and incorporation of manure into the soil was described as the most effective method of controlling odours and limiting nutrient loss. For this reason, there were calls that it be made mandatory. Representatives of larger producers stated that they currently injected wherever possible, the exception being on forage fields. Applicators urged the provincial government to implement its commitment to license all applicators.

Several people suggested that the dry manure systems associated with hoop-barn production systems were more environmentally friendly than the confinement system, although others disputed this. Finishing hogs on straw (hoop-barn production) was said to be advantageous in terms of capital investment and operating costs, lower odour production, production flexibility, ventilation, and animal welfare. It was acknowledged that the straw-based system could not serve as the basis for large-scale production.

Critics of the earthen manure-storage systems called on the Commission to ban them outright: if this were not done it was suggested that liners and covers be made mandatory and that the storage systems not be sited over aquifers. It was also suggested that the provincial government review the minimum capacity of storage facilities to allow for adverse weather and moisture conditions. Producers regularly made the point that they, their families, and their animals all depend on local groundwater sources, and therefore they are careful to make sure that the manure-storage systems do not contaminate groundwater. They also pointed to the requirement that they regularly test groundwater around the earthen manure-storage systems. If new manure-storage regulations were to be introduced, producers state the province should assist producers in meeting these new costs.

### 8.3 Land-use planning and approval

Opinions relating to land-use planning and the approval process for hog-production facilities were wide ranging. However, the most prevalent tension revolved around the hog industry's desire for consistent, province-wide rules that would make investment decisions more predictable, and the desire of local communities to retain the right to approve or reject local developments. While industry representatives wished to see hog-production operations declared permitted uses in areas zoned for livestock, municipalities sought the right to continue to declare intensive livestock operations conditional uses, even in areas zoned for livestock. Similarly, producers requested they be provided with an appeal from the decisions of rural municipalities, while municipalities insisted that their decisions remain final.

Concerns were also expressed over the quality of decision-making by rural municipalities. It was suggested that councillors lacked the background to make complex technical decisions, that they had conflicts of interest, bowed too easily to public pressure, and failed to enforce those restrictions that they placed on those hog-production operations that they did approve. It was often stated that a proposal for a hog barn created divisions in a community, although it was suggested that some of these divisions dissipated once a barn was in operation.

Producers stated that in the past municipalities that opposed hog production had placed prohibitive conditions on proposed developments. A number of municipalities were critical of The Planning Act, which restricts their ability to place conditions on new and expanding barns. It was felt that the freedom to develop appropriate local restrictions had allowed them to control the odour issue. Without the right to set such rules, they might have no option but to reject new proposals.

Several concerns were raised over the setback distances that have been developed for separating developments from residences, waterways, and protected areas. It was said that these were in need of updating in light of new research into public health, and did not provide adequate protection from odour. It was argued that, during the siting process, it is up to existing residents to demonstrate that the livestock operation will present an odour issue for residents. Some wished to see this onus reversed. Producers also called on the provincial government and rural municipalities to ensure that rural residential development does not encroach upon land designated for livestock production.

The Technical Review Committees (TRC) were the subject of considerable discussion.

Many acknowledged that the work of the TRCs has improved considerably over the years and some stated that they do an effective job of providing municipalities with the information needed to make informed decisions. Even those who were satisfied with the advice given by the TRCs stated that they lack sufficient resources and, as a result, there were significant delays in the TRC report.

Critics of the TRC process felt the committees tended to be advocates of the hog industry. They faulted them for not always making onsite inspections, relying too heavily on the proponent's information, and not having all members of the committee present at the council meeting where the committee report is discussed. There was concern that TRC members were being placed in conflict of interest situations, since they can be expected to assist proponents in developing proposals and then participate in the assessment of those proposals. There were also concerns that TRC recommendations were not acted upon, even though the project was approved.

Some felt that the TRC process provided the public with the illusion that an environmental review was being undertaken of each proposed hog barn. Some suggested that the only effective solution was to subject proposals to a full-fledged environmental assessment. Such a review would assess intensive hog production on the basis of industrial as opposed to agricultural regulation.

## 8.4 Groundwater quality

The key groundwater quality issue related to the hog-production industry arises from concerns that contaminants from barns, manure-storage facilities, or spread fields can reach groundwater supplies. Industry members pointed out that there has yet to be a link between the hog industry and contaminated water in Manitoba. The Commission was told that 90 per cent of rural wells that fail to meet drinking water standards are the result of substandard construction, location, or maintenance. What was needed, it was suggested, was a more aggressive policy to cap local wells. As noted above, producers stressed that they would be among the first affected by contaminated water and therefore take appropriate measures to protect groundwater. Finally, several suggested that there were cases where the siting of municipality wastewater lagoons was not as strictly regulated as the siting of livestock manure-storage facilities.

Others pointed to the number of manure-storage facility failures and spills that have taken place at certain hog operations and said that, in many cases, operators ignore the rules regarding application, at times even dumping liquefied manure into ditches. Furthermore, it was stated that storage facilities had been constructed over aquifers and on sandy soils or too close to surface water bodies. In the opinion of these individuals, the expansion of the hog industry has been coincident with an increase in water and air-quality problems.

## 8.5 Groundwater supply

The Commission heard sharply polarized views on the hog industry's impact on groundwater supply. Industry representatives stated that in comparison to either aquifer recharge rates or human use, the hog industry makes limited use of Manitoba's groundwater supply. Since many farmers are obliged to store the liquefied manure and later apply it at considerable cost, they have a strong incentive to control water use by employing more efficient drinking systems, better wash-down equipment, and leak detection alarms. Other presenters stated that it does not make any ecological sense to use water to create liquefied manure. It was also stated that if global warming increases the stress on local water supplies, the sustainability of the hog industry would be thrown into question. It was suggested that the Manitoba government not allow hog producers to self-monitor water use.

On a broader scale, some called for a comprehensive water usage policy to measure actual groundwater withdrawal rates, aquifer levels, and water quality on an ongoing basis.

## 8.6 Surface water quality

One point that was made repeatedly by producers was that the hog industry, which they stated represented only 1 to 1.5 per cent of the phosphorus loading of Lake Winnipeg, was being unfairly singled out as being responsible for phosphorus loading of rivers and lakes. Industry, municipalities, and the City of Winnipeg in particular, all played significant roles in discharging nutrients to surface waters and needed to improve their environmental performance. Why, presenters wanted to know, did the government not place a moratorium on the expansion of other activities that made a greater contribution to the phosphorus loading of the environment? Several pointed to local studies that suggested the application of manure to local fields was not leading to increases of phosphorus in local waterways.

Other presenters noted that drainage projects over the years had eliminated many of the marshes and wetlands that had served as natural filters for nutrient-rich water flows. They called for a reinvigoration of river and stream basin authorities and conservation districts through the province. It was also suggested that vegetated buffer zones should be mandatory around barns and spread fields.

Critics of the industry argued that the hog industry's contribution to the phosphorus load in Manitoba waters was much greater than 1.5 per cent. Concerns were also expressed about the threat presented to the earthen manure-storage facilities during flood periods. They suggested that dykes be required to protect the storage systems against flood, overflow, liner failure, and rupture.

## 8.7 Soil quality

As a stand-alone issue, there was little discussion of soil quality. It was noted that the new phosphorus regulation could lead some hog producers to put more marginal land into production to provide them with more spread fields. Furthermore, hog-industry regulation has led to a significant increase in provincial soil testing. Again, this was an area where some presenters argued there needed to be increased independent auditing and verification.

## 8.8 Odour

Producers presented several different perspectives on the issue of the odour created by hog production. Many suggested that noise, dust, and odour are facts of rural life and the needs of agriculture are more important than any idealistic view of country life. There was also a suggestion that the major source of complaint was people who had moved from the city to the country. Other producers did acknowledge that in the early years of intensive livestock operation—when manure was not injected and storage systems were not covered—odour was a severe problem. Many producers also spoke of how they warned neighbours when they would be applying manure and attempted to time manure application to avoid interfering with special events that neighbours were planning. By covering storage systems, injecting and incorporating manure when it is applied to fields, separating solids from liquids, and growing shelterbelts around storage systems, producers have attempted to minimize odour. Producers also stated that, for many small operators, a requirement to cover manure-storage facilities with synthetic covers would be economically ruinous.

Despite the introduction of these measures in many operations, the Commission heard from people who said that their daily lives and possibly their health had been seriously impacted by odour and emissions from hog-production facilities. They spoke of being prisoners in their own homes, of being hit by a wall of stench when they stepped outside, and of asthmatic and other respiratory problems related to hog barn exposure. The efficacy of shelterbelts was questioned, since by the time the shelterbelts are fully grown, the barns may well be ready to be decommissioned. Some farmers spoke of having to work with burning eyes when they are in the field at the same time that manure is being applied in a neighbouring field. Finally, the Commission was reminded that airborne emission issues might extend beyond odour. The emissions from hog operations include hydrogen sulfide and ammonia, toxins that are regulated when they are emitted by other industries.

Complaints about odour can be taken to the Farm Practices Protection Board. Some presenters felt that many people are not aware of the Board's existence and wondered whether it was able to respond quickly to any citizen complaints. Others called on the provincial government to develop a process to determine unacceptable levels of odour, and put in place a policy and enforcement mechanisms to address the issue.

Several presenters stressed that the best way to avoid odour problems is to ensure that the appropriate decisions are made during the land-use planning process. Others called for a return to the legal regime under which there were no restrictions on the right to sue for nuisance in response to odour complaints.

## 8.9 Disease transmission

Industry representatives stressed the fact that they had introduced a wide range of biosecurity measures to protect human and animal health. Many illnesses long associated with the hog industry are no longer present, as a result, and Manitoba pork enjoys a strong international reputation for quality. The segregation of swine from pets and animals had reduced the threat to human health from disease and parasites to negligible levels. Critics argued that the industrialization of livestock production over the past three decades has not been accompanied by commensurate modernization of regulations to protect the health of the public.

Health professionals raised concerns about the occupational hazards arising from working in hog barns, pointing to both a wide range of respiratory concerns and concerns over the possibility of hog to human-disease transmission. While hog barn workers are not covered by either workers compensation or employment standards legislation, they are covered by workplace health and safety legislation. Producers also stated that when Farm Practices Guidelines are followed, the risk to public health from manure handling or manure storage is low.

The question of whether antibiotics use could lead to situations where certain antibiotics would no longer be effective in treating humans was raised. Producers stated that there has been an ongoing decrease in the use of antibiotics and pointed out there is a requirement that hogs be antibiotic free when they go to slaughter. Some presenters suggested that straw-based operations spend more on feed but less on antibiotics.

Questions were also raised as to whether Manitoba was prepared for the implications that a disease-related border closing could have on an export-based highly productive livestock industry.

## 8.10 Climate change

The relationship between climate change and the hog-production industry was not extensively addressed during the meetings. Producers recognized that the industry contributes in a small way to climate change through the emission of greenhouse gases, but claimed these effects are mitigated to a large extent through the displacement of artificial fertilizers. Others said that if climate change results in a reduction of the local water supply, the impact on the hog industry could be significant. Producers stated that if greenhouse-gas issues required a reduction in the number of pigs being raised in Manitoba, producers would have to be compensated.

## 8.11 Environmental liability

The issue of environmental liability was not touched on in detail. While some presenters were worried that the public could be left with a significant clean-up bill should there be a major contamination of water or soil or in the event of a cost-related industry collapse, others stated that there currently exists appropriate legislation to deal with any environmental liabilities that occur in the future. While some suggested that the industry be required to pay into a fund that would cover any such liability, the industry argued that environmental liability issues are, in essence, site specific.

## 8.12 Other jurisdictions

Reference was made through the meetings to issues in other jurisdictions. From the producers' perspective, the point that was regularly made was that the Manitoba hog industry was one of the most heavily regulated hog industries in the world. Other presenters pointed to the European models of hog production that have alternative approaches to sow housing and strict budgeting of nutrients. Reference was also made to the impact of various swine-related diseases in other jurisdictions. The future of the North Carolina moratorium on manure-storage facilities was also highlighted.

## 8.13 Other issues

Many other issues were brought before the Commission. Perhaps the most obvious is the future of the current prohibition on industry expansion: some wished to see it lifted as soon as possible, while others suggested it be extended indefinitely. Similarly, some thought there was little need for change to the current regulatory and approval regime, while others believed that there was need for significant change if the current restrictions on expansion of the industry were to be lifted.

Social and economic issues were discussed extensively. The case was made that the hog industry was making a significant and positive contribution to the provincial economy and to the local rural communities. Furthermore, it stimulated a range of spinoff industries including construction and transport. The industry also represented an important local market for Manitoba grains in light of the end of the Crow Benefit.

From a different perspective, it was suggested that a full-cost accounting, that included all forms of subsidization, might lead to a conclusion that the industry is neither economically nor environmentally sustainable. According to this argument, large-scale hog operations encourage rural depopulation since small producers find it very difficult to compete with the larger producers. The fact that most large producers are corporately owned was cited as an indication that intensive livestock operations could serve as a drain on rural communities, since profits would not be retained locally. An associated argument was that meat production itself is a less sustainable form of agriculture than production for vegetarian diets. One measure that was urged on the Commission to reassert the interests of the small producer was to recommend a return to the single-desk sales system that had been established in the 1970s.

A recurring issue was that of lack of access to information about intensive livestock operation applications, Technical Review Committee reports, water quality, and manure management. It was argued that without such information, members of the public are not able to make an effective contribution to the debate on the environmental sustainability of the hog industry.

Animal welfare issues were also raised. Concerns were expressed about the treatment of animals both in gestation pens and transportation. It was also recommended that there be fire codes for hog barns.

Programs such as the Environmental Farm Plan were cited as examples of policies that provide meaningful assistance to farmers who wish to adopt more environmentally friendly practices. There were also calls to assist farmers in adopting organic farming practices.

The Commission was also urged to determine if the Manitoba government has a legal duty to consult with Aboriginal people on hog-industry development in cases where the industry could affect Aboriginal rights to fish or trap or might impinge on Aboriginal water rights.

As noted, not all the issues raised before the Commission fell under its mandate. However, the Commission has paid close attention to the presenters and to the written submissions that it received. They played an important role in identifying issues and providing the Commission with guidance. The input received during the meetings played an important role in shaping the analysis and recommendations presented in the second section of this report.

# 9 Water quality

## Introduction to Section Two

Chapter 6 of this report identified the barriers that lie between intensive hog production and environmental sustainability. In some cases, due to local conditions, the expected environmental complications do not materialize. In other cases, preventative or mitigating measures may be in place to allow the industry to maintain environmental sustainability. Finally, there may be requirements for enhanced measures to ensure the environmental sustainability of the industry. This section of the report surveys the current evidence regarding the various barriers, outlines government measures to regulate the issue, and makes recommendations where appropriate.

As was done in Chapter 6, this section will deal with the issues under the headings provided in the definition of the environment in *The Sustainable Development Act*: water, air, land, flora and fauna. This Chapter will deal with water-related issues: the first section of the chapter deals with water quality, the second section will deal with water supply. Chapter 10 deals with air-related issues. Chapter 11 deals with issues related to land, flora, and fauna—reflecting the interconnectedness of these issues. Chapter 12 deals with the decision-making process, while

Chapter 13 addresses information and research issues.

## 9.1 Water quality

The greatest environmental threat to water quality from intensive hog production comes from the liquefied manure that is stored in either earthen manure-storage facilities or above-ground manure-storage facilities and then applied to fields as fertilizer. The manure contains nutrients, pathogens, and heavy metals that can either leach into groundwater or run off into surface waters with potential negative environmental and health impacts. The most important point of concern for the Commission is the risk of environmental damage that can arise if these potential contaminates in the manure escape from the field into the surrounding environment. Such movement can arise either from loss from fields on which manure has been applied or if the storage system fails to provide the appropriate level of environmental protection. The Commission shall treat these two risks separately, starting with the risks related to field application of manure and moving to risks related to the integrity of manure-storage systems.

In November 2007, as the Commission was completing its work, the Manitoba Auditor General released an audit of Manitoba Conservation's Environmental Livestock Program. That audit deals with issues directly related to the subject of this chapter and is discussed in Box 9.1. In the body of this chapter, the Commission also makes reference to a number of the audit findings as they relate to issues identified by the Commission.

### 9.1.1 Environmental risk related to field application

The Commission was told by representatives of large-scale hog-production firms and manure-application firms that, in the case of large operations, most of the liquefied manure that they apply is either injected or incorporated shortly after application. According to the 2006 farm census, 65 per cent of all Manitoba hog farms inject manure (Brewin et al. 2007). Manure is usually applied without injection or incorporation on forage fields and pastures. Smaller operations use a range of application techniques, many of which do not involve injection or incorporation. Smaller operations (currently those under 400 animal units) can also apply manure on a year round basis.

Table 9.1 is based on the 2006 Census of Agriculture's data regarding the 768 Manitoba farms that are identified as predominant hog operations (which means

**Table 9.1: Manure application methods for predominant hog farms in Manitoba.**

| | Application Method | | |
|---|---|---|---|
| **Manure Type** | **Incorporated or injected (in the case of liquid manure)** | **Not incorporated** | **Applied by irrigation** |
| Farms reporting composted manure | 82 | 19 | |
| Hectares | 4,218 | 362 | n/a |
| Farms reporting solid manure | 84 | 33 | |
| Hectares | 3,160 | 870 | n/a |
| Farms reporting liquid manure | 336 | 135 | 17 |
| Hectares | 41,945 | 7,188 | 1,154 |

*Source: Statistics Canada, 2007.*

### Box 9.1: Audit of the Department of Conservation's Management of the Environmental Livestock Program

In November 2007, the Manitoba Auditor General released an Audit of the Department of Conservation's Management of the Environmental Livestock Program. The audit looked at the performance of the program from March 1998 to June 2005. The audit had four specific goals:

- To determine whether the Livestock Manure and Mortalities Management Regulation was generally comparable to legislation in other jurisdictions
- To determine whether Conservation had adequate processes in place to ensure operators of livestock operations comply with the key provisions of the Regulation.
- To determine whether Conservation used information available to further its efforts to protect surface and groundwater from contamination.
- To determine whether Conservation was sufficiently consulting with the Departments of Agriculture, Food and Rural Initiatives, Health, Intergovernmental Affairs, and Water Stewardship, as well as municipalities, on common issues related to water quality.

On the first point, the adequacy of manure application regulation, the Auditor General concluded that Manitoba laws were "more comprehensive and proactive than in some other provinces" (Auditor General of Manitoba 2007, 1). The report identified deficiencies in the control of manure by operations with multiple species; the lack of requirements for a specific number of days of storage; controls to address issues raised by the application of both manure and synthetic fertilizers on fields; the lack of required contingency plans for potential livestock manure emergencies; and lack of control over winter application.

The Commission has reviewed a number of these issues as part of its current Investigation. It is satisfied that the current manure management regulation gives the government the needed authority to control manure application on operations with over 300 animal units and that the regulation allows the government to require an appropriate storage capacity. Through the new Nutrient Management Regulation, the government is developing a regulatory framework to address non-manure nutrient application to fields. The Commission notes that Conservation has indicated that it is reviewing the LMMMR to determine if further changes regarding contingency plans are required. Changes to the LMMMR will place further restrictions on winter application of manure.

The Auditor General identified areas where Conservation could strengthen a series of operational issues. These included:

- The permitting process for manure-storage facilities.
- The construction monitoring process.
- Post-construction monitoring process.
- The registering of non-permitted manure-storage facilities.
- The monitoring of manure application.
- The fuller utilization of the available information system.

A wide range of issues was identified under these headings. Some, while serious, appear to have been isolated events, while others represent more immediate concerns. In most cases, Conservation indicated that it would be taking measures to address the

**issues raised by the Auditor General. The Commission also examined a number of this issues and makes recommendations on them throughout this report.**

**In two of its responses to the Auditor General, Manitoba Conservation made reference to the ongoing work of this Investigation. It was recommended that Conservation conduct an analysis of the livestock program's data to aid in the development of a strategic direction for the program and that it consult with other departments and municipalities to identify issues of common interest in sustaining the agricultural economy while at the same time protecting the environment. In response to both these recommendations, Conservation gave identical responses, namely that the recommendations included many of the tasks that had been assigned to this Investigation. While this Investigation has involved an assessment of the work that Conservation has undertaken, its focus has been more on the risks and regulatory framework than on Conservation's strategic direction. Similarly, while the Commission has consulted extensively with the public, these consultations do not preclude Conservation developing ongoing relations with other departments and municipalities to address agro-environmental issues.**

that hogs account for more than 50 per cent of receipts). It outlines the manure-application methods of these operators, showing that liquefied manure is applied to a total of 50,286 hectares of land and that 83 per cent of that manure is either incorporated or injected.

As noted above, liquefied manure can contain nutrients, pathogens, and heavy metals that represent potential environmental concerns. The next sections of this report review these issues individually.

### Nutrients

Estimates of the amount of nitrogen and phosphorus produced annually by Manitoba's hog industry vary between 22,500 and 24,000 tonnes for nitrogen and 5,000 and 7,000 tonnes for phosphorus. This is equivalent to 8-9 per cent and 12-17 per cent of the synthetic nitrogen and phosphorus fertilizer that is being added to Manitoba soils. It is also equivalent to 8-9 per cent and 11-15 per cent of the phosphorus and nitrogen that Manitoba crops remove. Currently, hog manure is applied to 120,000 hectares or 2.5 per cent of Manitoba's agricultural croplands (Rawluk and Flaten 2007).

Since 1994, Manitoba's Livestock Manure and Mortalities Management Regulation (LMMMR) has required that this manure be applied at rates that do not exceed the nitrogen crop-removal rate. As noted in Chapter 6, the ratio of phosphorus to nitrogen in manure differs from the ratio between the phosphorus and nitrogen removal rates for most crops. When manure is applied at the nitrogen removal rate, phosphorus is usually being applied at rates that are higher than the phosphorus crop-removal rate, potentially leading to build up of phosphorus in soils and phosphorus losses (mainly through surface runoff). To apply manure at the phosphorus crop-removal rate would require between 500,000 and 700,000 hectares (10-15 per cent of Manitoba's agricultural land base). In short, under the provisions of the LMMMR's nitrogen regulation, manure phosphorus was being applied at between four to six times the provincial average phosphorus crop-removal rate (Rawluk and Flaten 2007). This is an environmentally unsustainable rate of application.

If the nutrient management issue were simply a matter of getting access to more land, the sustainability issue could be easily resolved. Manitoba has 4.7 million hectares of cropland and each year synthetic fertilizer is applied to 3.5 million of these hectares (73 per cent of Manitoba cropland). Unfortunately, the issue is complicated by the intensive and regionalized nature of Manitoba hog production and the cost of transporting liquefied manure. Liquefied hog manure is less concentrated compared to commercial fertilizer, and comparatively more expensive to transport. As a result, it is currently uneconomical to apply all the hog manure produced in Manitoba at the phosphorus crop-removal rate.

The provincial government has been aware of the growing phosphorus surplus on lands fertilized with hog manure and the economic barriers to addressing this issue since at least the beginning of the decade. In response to the issue, it appointed a committee to review the issue and, in 2006, it acted on that committee's recommendations by amending the LMMMR to regulate the application of phosphorus.

### The Manitoba Phosphorus Expert Committee recommendations

In 2002 the Minister of Conservation appointed the Manitoba Phosphorus Expert Committee (MPEC) to recommend appropriate measures for regulating phosphorus application. The MPEC's 2006 report called for measures that addressed both source and transport factors associated with phosphorus in manure.

#### *Source factors*

#### Application rates

The MPEC's recommendation for source factors established three different thresholds and set maximum application rates for each threshold. The thresholds were based on soil tests that measure the presence of phosphorus that is available to plants in the soil in parts per million (ppm). These results are usually referred to as Soil Test P or Soil Test Phosphorus. The soil test commonly used in Manitoba is referred to as the Olsen Test. Table 9.2 sets out the MPEC's recommended phosphorus thresholds and application rates. (The MPEC recommendations actually refer to the application of P205, a phosphorus formulation. For simplicity, this report will refer to it as phosphorus).

As can be seen from the table, at levels of less than 60 ppm, the only limit on the application of phosphorus is the current nitrogen regulation. Given that the nitrogen and phosphorus ratios in manure are variable (depending on such factors as feed composition, age of the animals, and degree of agitation of the manure prior to application) and that different crops have different uptake rates for both nitrogen and phosphorus, it is not possible to make a specific statement as to what the phosphorus application rate is when one is applying manure at the nitrogen rate. However, the generally accepted range,

**Table 9.2: Manitoba Phosphorus Expert Committee recommended phosphorus application rates.**

| Soil Test Phosphorus Threshold | Phosphorus application rate |
|---|---|
| Less than 60 ppm phosphorus | Apply phosphorus on the basis of crop nitrate nitrogen requirements. |
| Between 60 and 119 ppm phosphorus | Apply phosphorus up to two times the crop-removal rate of phosphorus |
| Between 120 and 179 ppm phosphorus | Apply phosphorus up to one times the crop-removal rate of phosphorus |
| 180 ppm or greater phosphorus | No phosphorus application without written consent of the Director (Manitoba Conservation) |

*Source: Manitoba Phosphorus Expert Committee* depending on the crop, is between three and five times the phosphorus crop-removal rate. Under the MPEC recommendation, when the phosphorus level in the soil reaches 60 ppm, application must be restricted to twice the phosphorus crop-removal rate. At 120 ppm, the operator is required to apply at no more than the phosphorus crop-removal rate, while at levels of 180 ppm or higher, no phosphorus is to be applied without specific authorization. In essence, the recommendation allows phosphorus to build up in the soil until it reaches 120 ppm. At that level, operators must balance application with crop removal. At levels above 180 ppm, they must reduce the levels by allowing crops to remove the residual phosphorus.

The MPEC concluded that, due to the dilute nature of liquefied manure, it could be very difficult and expensive for manure application equipment to apply manure at the one-time phosphorus removal rate (particularly for crops with very low phosphorus crop-removal rates). To accommodate producers in these situations, it recommended that operators restricted to a one-times crop-removal rate be allowed to apply at up to five times the phosphorus crop-removal rate on the condition they not apply manure to the field in an equivalent number of following years. For example, if the operator applied at the four-times phosphorus crop-removal rate, the operator would be prohibited from applying manure phosphorus for the next four years.

Underlying the MPEC recommendations was a belief that many Manitoba soils could benefit, from an agronomic perspective, if modest increases in phosphorus in soil levels were allowed in the short-term with a future goal of establishing a balance between application and removal. In setting the thresholds, the MPEC was attempting to balance environmental protection and the economic survival of the food-production industry (Manitoba Phosphorus Expert Committee 2006).

#### *Nutrient transport factors*

In recommending measures that reduced transport-related risks, the MPEC recommended the establishment of two sorts of special management areas that would be subject to additional regulation. These zones were made up of either land that is subject to regular inundation or land located immediately adjacent to surface water. In the zones subject to inundation, the restrictions deal with timing of application; while in the zones located near water, the restrictions called for buffer zones between application and the surface water.

#### Inundation zones

Winter and fall application of manure present potential environmental problems. Winter-applied manure presents the greatest risk since it is applied on top of frozen ground and, come spring, is at great risk of being washed off the land in the snowmelt runoff. Nutrients in manure applied in the fall are also at risk of being lost to the environment through a variety of routes, including spring runoff rather than being taken up by crops. The 2001 Statistics Canada Agriculture Census showed that 66 per cent of operations in Manitoba with livestock applied manure in the fall. This fall application represented 54 per cent of the manure applied. Spring application accounted for 21 per cent of the manure applied and summer applications accounted for 22 per cent. Only three per cent of the manure produced in Manitoba was reported to have been winter applied. This winter-applied manure came from 11 per cent of operations (Rawluk and Flaten 2007).

At the time of the MPEC report, new and expanding operations and existing operations with more than 400 animal units were prohibited from applying manure between November 10 and April 10 of the following year. In 2004, the government had announced that existing operations with between 300 and 400 animal units had until 2010 to cease winter application of manure. The MPEC recommended that winter application be banned completely in the Red River Valley or flood plains of other designated rivers.

At the time of the MPEC report, all operations could apply manure to croplands from April 10 to November 10 without restriction on the manner of application (unless they were restricted by the municipality). The MPEC recommended that, in the Red River Valley or flood plains of other designated rivers, manure applied to tilled soils in the fall should either be injected or incorporated within 48 hours.

**Buffer zones**

Buffer zones between land where manure is applied and watercourses may reduce the risk of contaminants moving from the land to water. It is thought that permanently vegetated buffer zones provide a greater degree of protection than zones without such vegetation. The method of application of manure also increases the risk of contaminants moving off the land. When the manure has been injected or incorporated into the soil after application, there is a lower risk of loss. Taking these factors into consideration, the MPEC recommended a series of buffer zones between Manitoba watercourses and fields on which manure was being applied. Lakes were given the greatest degree of protection because they are at the greatest risk of eutrophication, while rivers, creeks, and large drains received the second highest level of protection since they are more likely to contain water on a year round basis, and therefore, are more likely to be transporting large quantities of nutrients.

Table 9.3 outlines the buffer zone recommendations in the MPEC report.

It also commented that in approving new livestock operations, planning bodies should "ensure the availability of a cropped land base within the region that will allow application of manure phosphorus at no more than can be removed by a crop in one year" (Manitoba Phosphorus Expert Committee 2006, 15).

The MPEC report also stressed that the recommendations that it was making could have serious economic consequences for producers and therefore needed to be phased in and coupled with financial incentives.

**Table 9.3: Manitoba Phosphorus Expert Committee buffer zone recommendations.**

| **Surface water or surface watercourse feature** | **Buffers** | **Manure application method and setbacks** | |
|---|---|---|---|
| | | **Injection/low level application with incorporation** | **High level broadcast application/low level application with no incorporation** |
| Lakes | Permanently vegetated buffer strip of 15 metres; no manure application | 15-metre setback | 30-metre setback |
| Rivers, creeks and large unbermed drains | Permanently vegetated buffer strip of 3 metres; no manure application | 3-metre setback | 10- metre setback |
| Smaller watercourses such as roadside ditches that are designated drains, and other lower order drains | Permanently vegetated buffer strip of 1 metre; no manure application | 1-metre setback | 1-metre setback |
| | Manure application setback width with no permanently vegetated buffer | 5-metre setback | 5-metre setback |

*Source: Manitoba Phosphorus Expert Committee*

### LMMMR amendments based on MPEC recommendations

In November 2006, the Manitoba government announced changes to the LMMMR that were based on the MPEC recommendations and public consultation.

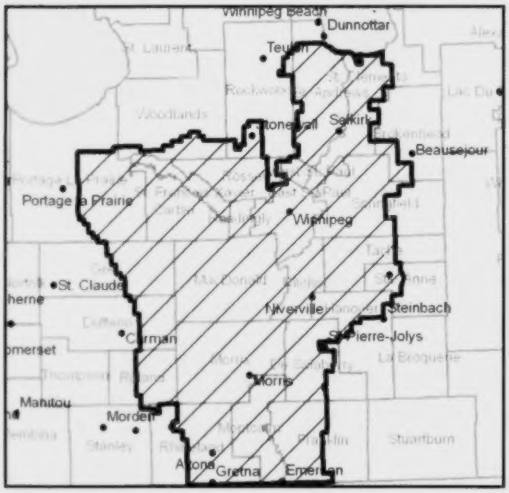
#### *Source factor regulation*

The LMMMR was amended to adopt the MPEC recommendations on application rates, including the allowance for up to five-times application providing no manure be applied during an equivalent number of following years.

#### *Transport factor regulation*

The November 2006 change to the LMMMR also led to the definition of the Red River Valley Special Management Area (RRVSMA) (see Map 9.1). In this area, the regulation banned winter application and required that any manure applied between September 10 and November 10 be either injected or incorporated into the soil within 48 hours. Operators are exempt from the injection and incorporation provisions if perennial forages are established on the land or the soil is not disturbed except for seed planting or commercial fertilizer application and there is adequate crop residue on the land to control erosion.

**Map 9.1 Red River Valley Special Management Area.**



*Source: Manitoba Conservation*

Outside the RRVSMA, operators with fewer than 300 animal units are allowed to continue to winter apply. As noted above, operators with between 300 and 400 animal units will no longer be allowed to winter apply manure after 2010.

When it came to establishing buffer zones between manure application and different watercourses, the Manitoba government made a number of adjustments to the MPEC recommendation. Where the MPEC was requiring permanently vegetated buffer zones for large water features such as lakes and rivers, the LMMMR allows for buffer zones that do not have permanent vegetation. The setbacks for these zones are greater than for the permanently vegetated zones. For smaller watercourses such as roadside ditches that are designated drains, and other drains, the MPEC recommended either a one-metre permanently vegetated setback or a five-metre non-permanently vegetated setback. Following consultation with producers, the government dropped the setbacks for smaller watercourses recommendation as being impracticable, choosing to continue its prohibition on any application of manure into waterways. Table 9.4 outlines the setback regulations in the LMMMR.

#### *Phase-in of changes*

The MPEC had recommended that the changes it was proposing be phased in to allow producers to adjust to the new regulatory regime (See Box 9.2 for estimates on the cost of compliance.) The amendments to the LMMMR adopted this approach. Table 9.5 shows the schedule by which the phosphorus application-rate regulation is being phased in. In setting the phase-in dates, Manitoba Conservation determined that a lengthier period was required for those areas of the province where the amount of phosphorus in the manure produced annually by livestock exceeds twice the crop removal rate: in practice this refers to operations in the rural municipalities of Hanover and LaBroquerie.

In addition to this phase-in period, the ban on winter application in the RRVSMA by operators with fewer than 300 animal units will not come into effect until November 10, 2013.

**Table 9.4: Manure application setbacks in the Livestock Manure and Mortalities Management Regulation.**

| Surface water or surface watercourse feature | Buffers | Manure application method and setbacks | |
|---|---|---|---|
| | | Injection/low level application with incorporation | High level broadcast application/low level application with no incorporation |
| Lakes | Permanently Vegetated Buffer | 15-metre setback, consisting of 15-metre permanently vegetated buffer | 30-metre setback, including 15-metre permanently vegetated buffer |
| | No Permanently Vegetated Buffer | 20-metre setback | 35-metre setback |
| Rivers, creeks and large unbermed drains, designated as an Order 3 or greater drain on plan of Manitoba Water Stewardship, Planning and Coordination, that shows designations of drains | Permanently Vegetated Buffer | 3-metre setback, consisting of 3-metre permanently vegetated buffer | 10-metre setback, including 3-metre permanently vegetated buffer |
| | No Permanently Vegetated Buffer | 8-metre setback | 15-metre setback |
| All other types of surface water or surface watercourses | No manure application allowed into these watercourses. (No change from previous LMMMR). | | |

**Table 9.5: Phase-in of phosphorus application provisions of the Livestock Manure and Mortalities Management Regulation.**

| Type of operation | Date by which the operator must be compliance with the regulation |
|---|---|
| New and expanding operations | Immediately |
| Existing operations* | November 10, 2008 |
| Existing operations that by November 10, 2008, submit plans as to how they will achieve compliance with the regulation | November 10, 2013 |
| Operations in areas where the amount of phosphorus in the manure produced annually by livestock exceeds twice the crop removal rate | November 10, 2015 |
| Operations in where the amount of phosphorus in the manure produced annually by livestock exceeds twice the crop removal rate that by November 10, 2015, submit plans as to how they will achieve compliance with the regulation | November 10, 2020 |

**Existing means in operation prior to registration of Manitoba Regulation 219/2006.*

**Box 9.2 Cost of compliance**

Manitoba Agriculture, Food and Rural Initiatives (MAFRI) has developed estimates as to the cost of complying with the new phosphorus application rate and the ban on winter application. It is estimated that 93 large (over 300 animal units) and 75 small (under 300 animal units—most of which are located in the rural municipalities of Hanover and LaBroquerie) do not have access to sufficient spread acres to comply with the phosphorus-application-rate regulation. If the operations complied by investing in various manure-treatment and separation technologies, MAFRI estimated that the average cost per operation of compliance would be $300,000, with a total cost of $50.4-million. MAFRI estimated that 65 small (under 300 animal unit) operations would be affected by the ban on winter application in the RRVSMA. It estimated that the cost of developing the needed manure-storage capacity would be $40,000 per operation (this does not include the cost of any synthetic covers). The estimated cost of compliance with the ban on winter application for those producers would be $2.6-million. Another study has estimated that the cost of the regulation amounts to between $0.15 to $3.50 per marketed hog (Salvano et al. 2006). A third study indicated that the cost of moving to a situation where all producers applied manure phosphorus at the plant removal rate would be $28-million (Mann and Grant 2006).

### Comment

Based on the principles and guidelines in *The Sustainable Development Act*, the Commission is of the opinion that sustainable nutrient application policies should:

- See manure replace synthetic fertilizers in crop fertilization as much as possible.
- See manure phosphorus applied at rates that do not exceed crop requirements.
- Decrease the risk of nutrients leaving the land and entering waterways.

The Commission is not convinced that the newly introduced phosphorus application-rate regulation will ensure the environmental sustainability of the hog-production industry. The Commission has no argument with the central thrust of the LMMMR phosphorus regulation, which is to bring the application of manure phosphorus into balance with the removal of manure phosphorus. The Commission has reservations about the threshold that has been chosen for achieving that balance and the phase-in periods that have been developed. While it is not recommending immediate changes to the application-rate regulation, it is proposing a change to the phase-in dates and a complete ban on winter application. Furthermore, the Commission will be recommending that further research and monitoring be undertaken immediately to prepare for a full-scale review of the regulation in five years time, as recommended by the MPEC.

There are at least three crucial questions that need to be addressed by such a review:

- Are the LMMMR application-rate thresholds set at the correct levels for long-term protection of the environment?
- Is the right tool (in this case, soil test phosphorus levels) being used to assess risk?
- Where is it appropriate to surface-apply manure?

### The application-rate thresholds

The soil test phosphorus measurement in parts per million was originally developed to assist producers in determining the amount of phosphorus they needed to achieve the desired crop benefit. The Manitoba government has produced a soil fertility guide that advises producers as to the recommended quantities of phosphorus they should apply to each crop, depending on the soil test phosphorus rating. According to that guide, a 15 ppm soil test phosphorus level is high and a reading of 20 or more is described as "very high plus." Even at the high rating, the guideline does recommend limited phosphorus application for most crops. However, for crops such as canola, mustard, peas, lentils, fieldbeans and soybeans, and perennial grasses and forages, it indicates that there is no agronomic benefit from the application of phosphorus when the soil test phosphorus levels are above 20 ppm (Manitoba Government 2007b, 53).

The application-rate regulation thresholds of 60, 120, and 180 ppm that have been adopted in the LMMMR are obviously all above the very high plus rate of 20 ppm. When one takes into account the phase-in periods, these thresholds will have a very limited impact on the current level of manure phosphorus application to Manitoba soils, which is four to five times the phosphorus crop-removal rate. The regulation will allow for continued excess application of phosphorus. It is only when the 120 ppm is reached that operators need to reduce their application to one-times the phosphorus crop-removal rate.

This approach is further complicated by the lack of scientific evidence to support the view that, at levels up to 120-ppm, phosphorus did not leave the soil. The evidence that does exist suggests that phosphorus leaves the soil at all levels, although the soil's ability to retain phosphorus decreases as the amount of phosphorus in the soil increases. As the rate of phosphorus application to the soil increases, the rate of phosphorus loss to the environment is likely to increase. If producers adhere to the minimum requirements in the current phosphorus application-rate regulation, only a relatively small number of producers will be required to reduce their phosphorus application. Furthermore, given the phase-in periods, many large-scale producers will not have to comply with the regulation until between 2015 and 2020.

In developing its recommendations, the MPEC had to deal with the fact that there has been limited research done on the relationship between soil test phosphorus levels in Manitoba soils and their relationship to the phosphorus levels in Manitoba waters. Without such research, it is not possible to develop thresholds with a strong science base. In the face of this lack of research, the MPEC was obliged to supplement the work done in Manitoba with research carried out in other locations and regulations that have been introduced in other jurisdictions. Manitoba's thresholds are higher than those in some jurisdictions and lower than those in other jurisdictions. However, comparisons may be of limited value without close comparison of a range of complicating factors including soil types, topography, and climate.

### The risk measurement tool

There is a second significant point of debate when it comes to the Manitoba regulation. This concerns the use of soil test phosphorus to measure the risk of phosphorus loss. The soil test phosphorus measures have a number of advantages. They are well understood in the agricultural community, where they are used to determine whether there is a need to add phosphorus to the soil and, when used in the LMMMR, it is a simple and straightforward tool. Research suggests that, in Manitoba conditions, they may provide an effective measure of risk (Rawluk and Flaten 2007).

An alternative tool is a phosphorus index; such an index would use the relevant source and transport indicators (for example, rate of application, type of application, erosion, rainfall) of phosphorus loss under local conditions in determining the risk assessment. The phosphorus indices that have been developed elsewhere are not currently applicable in Manitoba (they pay little attention to snowmelt and considerable attention to rainfall, which is far less plentiful in Manitoba than in many jurisdictions that have developed indices). When these indices have been applied to Manitoba, they have significantly underestimated the potential risk of manure phosphorus loss (Nicolas et al. 2002).

Another proposed risk measurement tool is the degree of soil saturation. This measures the soil's capacity to retain phosphorus and the degree to which this capacity has been saturated. It is argued that it is a more accurate determinant of whether or not the phosphorus is going to be lost.

It may be the case that soil test phosphorus, on its own, may be able to predict the risk of manure phosphorus loss for the major routes in Manitoba. However, the debate on this issue remains open.

### Surface application of manure

The Commission was informed that most of the liquefied manure that is applied to land as fertilizer is either injected or incorporated. The exceptions include grasslands, forage fields, and pastures, where the common method of application is surface application. Traditionally these crops would only receive synthetic fertilizer (usually nitrogen) when grown on moist soils and when hay and forage prices were high. Otherwise, there was little economic benefit to be received from fertilizing them. Many crops grown on these fields, particularly grasses, do use considerable amounts of nitrogen but have a low need for phosphorus, while others such as alfalfa and leguminous crops do not require nitrogen but need limited amounts of phosphorus. Grass and forage crops have traditionally been the most appropriate crops to grow on marginal soils, which often have high risk of leaching and runoff.

Pastures are usually developed on marginal soils, which have low nutrient absorption capability and relatively high rates of runoff. This is compounded by livestock activity that compacts the soil. The compacted trails leading directly to a water source may serve as a pathway to nutrient deposition in surface waters. It has been traditional practice in Manitoba agriculture to develop pastures on land with year round access to surface water.

The Manitoba Livestock Manure Management Initiative has supported research on hog manure application to grassland and pasture over a three-year period. Preliminary results of this research are now becoming available. These studies show that surface application of hog manure has greatly increased the production of haylands but has not resulted in the same gains on pastures. These studies also raised some concerns that should be addressed before surface application of hog manure is further promoted on grasslands and pastures. Nutrients are remaining in the top layers of soil in both the haylands and pasture, and are therefore vulnerable to runoff. The greatest build up of nutrients was found on bare areas where livestock traffic was more intense, even though the researchers avoided the application of manure in these areas (Ominski 2007).

There needs to be further research into all three issues: the phosphorus thresholds, the risk assessment tool, and surface application. The Commission believes that future research will, in all likelihood, lead to regulatory changes that require operators to achieve balance at lower threshold levels than are mandated by the current regulation.

#### Other issues

In addition, to these three overarching concerns, the Commission also has identified these issues:

- The lengthy phase-in dates for the regulation on manure application rates, particularly in the intensively developed areas. The phase-in dates are very generous, particularly for the intensively developed areas. It may not be until 2020 that operations in these areas (which account for a quarter of the provinceís hogs) will be in compliance with the regulation.

- The up to five-times crop-removal rate exemption. While the operator cannot reapply manure until the soil test phosphorus level returns to an adequate level, overapplying manure in this manner increases the amount of nutrients that is at risk of being lost.

- The lengthy phase-in period of the ban on winter application by operators under 300 animal units in the RRVSMA (it does not come into effect until November 2013). Winter applied manure is at great risk of nutrient loss.

- The lack of restriction on winter application by operators with fewer than 300-animal units outside the RRVSMA. Again, winter-applied manure is at great risk of loss.

- The lack of restrictions on fall application outside the RRVSMA. Nutrients in fall-applied manure that are not injected or incorporated have an elevated risk of loss.

- The lack of restrictions on fall application to perennial forages. There is an elevated risk of loss of nutrients under these conditions.

- The lack of restrictions on application on pasture. There is an elevated risk for loss of nutrients under these conditions.

- The lack of buffer zones for smaller watercourses. The buffer zones proposed by the MPEC were intended to reduce the risk of direct phosphorus addition to surface water bodies.

**Comment**

The Commission has identified a number of serious concerns with the provisions in the LMMMR for the regulation of manure phosphorus. At the heart of all the Commissionís concerns is a recognition that presently and for a considerable period of time to come, phosphorus will be applied at a rate greater than the crop-removal rate. In short, it will be applied in an inefficient manner, will not displace as much synthetic fertilizer use as is possible, and is at greater risk of entering Manitoba waterways. Furthermore, it is not likely to contribute to the rehabilitation of those watercourses that are already experiencing eutrophication.

These criticisms must be balanced by the recognition that the phosphorus regulation is an important first step in addressing the imbalance in manure phosphorus use in Manitoba. Only two other Canadian jurisdictions regulate phosphorus, and the Manitoba regulation appears to compare well with those in other locations. Second, the regulation has been developed with consideration for a range of social and economic factors, that the Commission is not directly considering in this Investigation. The Commission notes that the current regulations were developed by an expert committee, have been endorsed by the Lake Winnipeg Stewardship Board, and were adopted only after public consultation. Finally, the limited amount of hard data relating to phosphorus loss in Manitoba means that the Commission is not in a position to recommend an alternate set of thresholds, risk criteria, or buffer zones.

For these reasons, the Commission is not recommending that the phosphorus regulation be abandoned. The Commission is however recommending that the phase-in period be shortened, with full compliance being required by 2013. Secondly, the Commission is calling on a complete ban on winter application of manure throughout the province. This is consistent with the thrust of the recent Auditor General's report, which recommended that the limits on the application of manure on frozen or snow-covered ground should apply to all livestock operations.

The Commission is also recommending that the government implement the final two recommendations in the MPEC report. Those recommendations read as follows:

3.1 The Minister of Conservation should review the effectiveness of the new phosphorus-based regulation no later than five years after its coming into force.

3.2 Manitoba Conservation should work with other organizations to develop science-based, environmentally and economically sound beneficial management practices for reducing phosphorus losses to surface waters under Manitoba's soil, landscape, and climatic conditions.

It is imperative that the government undertake the five-year review. Furthermore, the Commission believes that no satisfactory review of the regulation can take place without considerably more research being undertaken in advance to determine the appropriateness of the threshold and risk measures. For this reason, the Commission is recommending that the Manitoba government ensure that the appropriate scientific research and monitoring commences immediately and is completed in time for the five-year review of the phosphorus regulation.

The Commission has, for the most part, not dealt with social and economic issues. However, the Commission recognizes that the current phosphorus regulation will have a negative economic impact on operators. When the government announced the changes to the regulation in November 2006, it stated that there would be financial assistance to help operators adjust. The Commission believes that operators who were operating in compliance with existing regulations should be aided in making the transition to the new rules. For this reason it recommends that the government provide operators with the assistance or incentives needed to bring their operations into conformity with the new regulation.

There is a strong possibility that the five-year review of the regulation will lead to the adoption of an even stricter regulation. If such changes are adopted, they will likely have an additional negative impact on producers and future assistance may be required. The Commission believes that one way of limiting the need for such assistance is to require that all new or expanding livestock operations be able demonstrate that they have access to enough land to apply manure phosphorus at the one-crop-removal rate. Both the MPEC and the Lake Winnipeg Stewardship Board made this recommendation in their reports. The Commission believes that the recommendation is in keeping with concepts of sustainability, efficient use of resources, and environmental protection.

The over-application of phosphorus is exacerbated by the fact that nitrogen from manure is lost to the atmosphere during storage and application. This loss contributes to both the odour complaints and the increase in greenhouse gases. It can be addressed by the use of synthetic covers for storage facilities and the injection or incorporation of manure when applied. This will be further addressed in Chapter 10.

The government should assist producers in efforts to adopt and develop techniques that reduce the liquid volume of manure. Such measures would reduce the cost of transporting nutrients, resulting in more effective use of manure nutrients and a reduction in the pressure to convert natural lands to croplands.

While spring application is preferable for the control of nutrient loss, the Commission recognizes that, from a producer perspective, spring application presents a number of serious problems given the limited period of time that exists between thaw and the time by which they must have their fields seeded. Government and industry should encourage producers to move to barn and manure-storage facility management that maximizes spring and summer supply and application.

## Recommendations

9.1 The phase-in dates for the Livestock Manure and Mortalities Management Regulation phosphorus provisions be adjusted so that all operators are required to be fully compliant with the regulation by 2013.

9.2 The ban on the winter application of manure in the Livestock Manure and Mortalities Management Regulation be extended to all operations by 2013.

9.3 The Manitoba government undertake a review of the phosphorus application provisions of the Livestock Mortalities and Manure Management Regulation after the regulation has been in place for five years. The review should include:

- Trends in soil test phosphorus by region.
- Enforcement effectiveness and compliance.
- Effects of soil test phosphorus values on adjacent watercourses/water quality.
- Evaluation of thresholds.
- Evaluation of risk assessment tools.
- Evaluation of management practices to reduce phosphorus-related environmental risks.

Such a review will depend on the availability of a wide range of water quality data. The water monitoring efforts needed to acquire these data should commence immediately.

9.4 The Manitoba government immediately conduct, facilitate, collaborate on and commission research on soil test phosphorus and transport mechanisms that will lead to the calculation of a phosphorus threshold specifically for Manitoba soils and climatic conditions. This research should include an examination of the effectiveness of a phosphorus index for Manitoba. This threshold should be considered in the review of the phosphorus regulation.

9.5 The Manitoba government work with other organizations to develop science-based, environmentally, and economically sound beneficial management practices for reducing phosphorus losses to surface waters under Manitoba's soil, landscape, and climatic conditions.

9.6 The Manitoba government provide livestock operators with financial assistance or incentives to assist them in coming into compliance with the phosphorus provisions of the Livestock Manure and Mortalities Management Regulation. This should include funding for the implementation of effective beneficial management practices.

9.7 The Manitoba government amend the Livestock Manure and Mortalities Management Regulation to require that new and expanding operations be required to demonstrate that they have a sufficient cropped land base available to balance phosphorus application rates with removal rates over the long-term.

9.8 The Manitoba government and industry encourage producers to move to barn and manure-storage facility management that maximizes spring and summer supply and application.

9.9 The Manitoba government facilitate, encourage, and undertake further studies into the cumulative effects of applying manure fertilizer to marginal lands. This should include the examinations of pathogen movement and transfer, and nutrient run-off.

9.10 The Manitoba government assist producers in efforts to adopt and develop techniques that reduce the liquid volume of manure. Such measures would reduce the cost of transporting nutrients, resulting in more effective use of manure nutrients and a reduction in the pressure to convert natural lands to croplands.

### Nutrient Management Regulation

While Manitoba has been regulating the application of the nutrients in manure since 1998, it currently does not regulate the application of the nutrients contained in synthetic fertilizers. This lack of regulation of synthetic fertilizers was one of the issues identified in the recent Auditor General's report. This will change when the Nutrient Management Regulation (NMR) of *The Water Protection Act* comes into effect. The regulation will be phased in, and is expected to be in full effect by January 1, 2011.

The NMR focuses on the application of substances containing nitrogen and phosphorus to the land and limits the establishment of certain types of nutrient generating facilities (such as manure-storage facilities, confined livestock areas, sewage treatment plants, and wastewater treatment lagoons) in environmentally sensitive areas. The zones that it establishes are all in southern Manitoba and a separate regulation will be developed for northern Manitoba.

The Regulation establishes six different Water Quality Management Zones for Nutrient Management: N1 through N5, and a sixth category for nutrient buffer zones. In zones N1-N3, nutrient application is allowed, while in N4-N5, it is not allowed. Application is also banned in nutrient buffer zones. Manure-storage facilities, confined livestock areas, septic fields, sewage treatment plants, and wastewater treatment lagoons are not to be located in Zone N4 and in Nutrient Buffer Zones. Operators who have manure management plans registered under the LMMMR are exempt from the regulation for the lands on which they spread manure.

The zones are based on a number of factors such as slope, topography, soil texture, erosion, soil characteristics, and crop yield. Zone N1 is made up of what are described as highly productive lands and accounts for 60 per cent of the land in central and southern Manitoba. Zone N2 is made of up of land with moderately productive soils and accounts for 11 per cent of central and southern Manitoba, while Zone N3 is marginally productive land and accounts for 10 per cent of central and southern Manitoba. Zone N5 is made up of urban and built up areas.

Zone N4 is non-productive land with a high risk of loss of nutrients. It covers approximately 16 per cent of central and southern Manitoba. Nutrient buffer zones include lakes, reservoirs, rivers, creeks, or streams, drains and ditches, major wetlands, bogs, marshes or swamps, and constructed stormwater retention ponds.

While the LMMMR uses agricultural capability classifications for determining nutrient application rates for different areas of the province, the NMR's zones and the LMMMR's classification are in large measure the same.

#### Nutrient application

For nutrient application, the NMR sets essentially the same limits for the application of nitrogen and phosphorus that are found in the LMMMR. It also introduces the concept of a nutrient management plan, which is similar to manure management plans. Unlike manure management plans, nutrient management plans are only mandatory for existing operators who are applying nutrients in Zone N4 (new or expanding operators are not allowed to apply nutrients in Zone N4). In zones N1 to N3, operators do not have to register nutrient management plans as long as they are applying nutrients at a rate that does not exceed the nitrogen and phosphorus limits. Golf courses are also required to establish nutrient management plans.

### Nutrient buffer zones

Nutrient buffer zones include lakes, reservoirs, rivers, creeks, streams, drains, ditches, and a variety of wetlands. The regulation outlines distances that must be maintained between these zones and the application of nutrients. These distances are increased in the case of those lakes, reservoirs, rivers, creeks, and streams that the government has designated as vulnerable. These setback distances are in essence the same as appear in the LMMMR. Table 9.6 outlines the nutrient application distances in the NMR. It can be compared with the set distances in the LMMMR in Table 9.4. As with the LMMMR setbacks, it had originally been proposed that there be setback distances for the smaller drains and ditches and minor wetlands, bogs, marshes or swamps, but these setbacks were dropped during the consultation process.

### Small livestock operators

The NMR applies to those livestock operators with fewer than 300 animal units (since they are not required to register plans under the LMMMR). This is not a significant change, since these operators are currently subject to the LMMMR nitrogen and phosphorus regulations. They will be required to file nutrient management plans if they are currently applying manure on land in Zone N4.

### Comment

In large measure, the NMR simply extends the provisions of the LMMMR to sectors of Manitoba society that apply nutrients to land. This is a positive measure. However, there are minor differences in terms used in the regulations (For example, NMR uses the concept of zones and vulnerable watercourses, while the LMMMR does not.) These variances may unnecessarily complicate the lives of producers. Complications could arise if two different departments, Water Stewardship

**Table 9.6: Nutrient application setback levels in the Nutrient Management Regulation.**

| Water body | Nutrient application setback width if the applicable area is covered with permanent Vegetation | Nutrient application setback if the applicable area has no permanent vegetation |
|---|---|---|
| A lake or reservoir designated as vulnerable | 30 metres | 35 metres |
| A lake or reservoir (not including a constructed stormwater retention pond) not designated as vulnerable<br>A river, creek or stream designated as vulnerable | 15 metres | 20 metres |
| A river, creek or stream not designated as vulnerable<br>An order 3, 4, 5, or 6 drain<br>A major wetland, bog, marsh or swamp<br>A constructed stormwater retention pond | 3 metres | 8 metres |
| A groundwater feature | 15 metres | 20 metres |
| Minor drains and roadside ditches | No application to the edge of the water drain or ditch. | |
| Minor wetland, bog, marsh, or swamp | No application to the edge of the high water mark. | |

and Conservation, end up enforcing what is in many ways the same regulation on the same operation at the same time. As much as possible, the Commission would prefer to see more uniformity in regulation and enforcement, possibly culminating in a single regulation dealing with nutrient application to land. At the very least, there should be common systems of classification and administration. Given that currently Manitoba Conservation has the responsibility and authority to enforce the LMMMR, it might be appropriate to also have Conservation responsible for the administration and enforcement of the NMR.

### Recommendation

9.11 The Manitoba Government reconcile the differences in terminology (particularly in relation to zones and classifications) in the Livestock Mortalities and Manure Management Regulation and the Nutrient Management Regulation.

### Nutrient budgets

Nutrient budgets quantify the nutrients entering and leaving a system, making it possible to better understand and control their flow. They constitute a useful tool in ensuring that nutrients are managed in an environmentally sustainable manner. These budgets are important farm level tools, but they also can be developed on a regional or watershed basis. In its 2006 report, the Lake Winnipeg Stewardship Board recommended that:

> A terrestrial nutrient budget should be developed for Manitoba that would consider all agricultural nutrient sources such as manure, feed, and inorganic fertilizer, as well as all agricultural nutrient exports such as harvested grain, crop residue removal, sales of animals, milk and eggs. It is essential that the terrestrial nutrient balance be considered when intensive operations are being sited and when manure is being applied to agricultural land. (Lake Winnipeg Stewardship Board 2006, 65)

The tools and a good deal of the data (municipal wastewater treatment effluents, synthetic fertilizer application figures, land livestock manure application contributions) required to develop such a budget already exists. This information should be used to develop nutrient budgets for agricultural Manitoba on a sub-watershed and ultimately a watershed basis. This information would play an invaluable role in assisting producers in selecting appropriate nutrient management practices and in determining siting decisions for future hog-production operations. Without such budgets, there is a limited ability to assess the cumulative impact of proposed hog-production operations on a local and downstream basis.

Nutrient budgets would be an important element in the development of the sort of watershed planning that is envisioned under *The Water Protection Act* that is discussed in Chapter 12. They would provide a framework within which Conservation Districts and other water management and planning authorities could reduce nutrient loss to the environment. The Watershed Institute proposed in Chapter 13 could play an important role in developing such budgets.

### Recommendation

9.12 The Manitoba government develop a nutrient budget for agricultural Manitoba on a sub-watershed and, ultimately, a watershed basis.

### Pathogens

Hogs, along with many other types of animals, can be hosts to pathogens (viruses, parasites, and bacteria) that can cause foodborne and waterborne diseases in human beings. Hogs excrete these pathogens, and as a result, hog manure can serve as a step in the route that these pathogens can travel from hogs to human beings. The potential also exists for pathogens in manure that is surface applied being consumed by wild animals that are grazing on pastures and forage fields. While farmers keep their animals off manured fields until the pathogens are likely to have died, it is impossible to manage wild animals in this way. Resident and transitory wildlife, such as moose, deer, elk, birds and rodents often feed, graze and make their homes in pastures. In some cases, the animals may not develop an illness, but may serve as a reservoir for the pathogen.

A paper prepared for the Commission concluded that, "The way hog manure is handled on farms in Manitoba has the potential to cause adverse environmental effects through pathogen contamination of plants and water" (Holley et al. 2007, 305). While pathogens cannot live indefinitely in manure, the fact that liquefied manure-storage facilities regularly receive fresh inputs of manure means that the facilities are rarely, if ever, pathogen-free. Commonly, the pathogen level reaches a stable state in the manure. Those operations with multi-cell lagoons have the capacity to reduce the pathogen content of the manure if they are managed in an appropriate manner (Holley et al. 2007).

Without additional treatment, which most Manitoba operations do not engage in, pathogens will be present in manure applied to land. There, they are at risk of moving into surface water, groundwater, or being taken up by animals grazing on pastures. Once they are applied to the fields, the pathogens can survive for approximately 30 days. Pathogens in manure that is injected or incorporated are likely to survive for longer periods than pathogens in surface-applied manure. However, pathogens in injected or incorporated manure are less susceptible to moving off the land with runoff and contaminating surface water. Research indicates that from the perspective of pathogen control, spring is the most appropriate time to apply manure (Holley et al. 2007).

Produce that is consumed without cooking is at particular risk of pathogen contamination, since once it is contaminated with pathogens it cannot be rendered safe for consumption (Holley et al. 2007). In Manitoba, manure is largely used to fertilize grain and cereal crops and forages. Potatoes are the only vegetable fertilized with liquefied manure, but because potatoes are grown below ground and cooked before being eaten, the pathogens do not represent a health risk. While there is no prohibition against using manure on fruits and leafy vegetables, provincial guidelines recommend against the practice.

### Pathogen regulation

There are no federal or provincial standards for pathogen reduction or hygiene standards for animal manures that are to be applied as fertilizers. However, a number of provincial policies related to manure storage and handling may provide a measure of protection against the risk presented by pathogens. All measures intended to halt the movement of manure into waterways serve to reduce contamination pathogen risks. These would include the setback distances from watercourses and water sources in siting regulations, the regulations regarding the integrity of manure-storage facilities, and the buffer zones established between watercourses and manure application. The ban on winter application in certain zones and the new restrictions on fall application will provide additional protection. There is also research that suggests that when manure is applied at agronomic levels (matching crop-removal rates) pathogens have shorter survival periods (Holley et al. 2007). While it is not required by regulation, the province does recommend that there be a 30-day delay between the time of application of manure to a pasture and the time livestock are allowed to graze on the field (Holley et al. 2007).

It should also be noted that pathogens, because of their relatively short life spans, present a greater risk to surface water than to groundwater.

Aside from these measures to reduce the pathogen transit risk, measures can also be employed to treat manure to reduce pathogen presence. In some European jurisdictions, regulations are in place for the treatment of manure before it is transported off the property. Currently, some Manitoba hog producers treat and largely eliminate pathogens through composting. Potential treatment measures for liquefied manure include: aerating liquid hog manure, treating with ammonia or urea in covered manure-storage facilities, and, with appropriate management techniques, storing in multi-cell manure-storage facilities.

### Comment

The Commission recognizes that pathogen control is an important public-health issue. While the hog industry is a potential source of pathogens that can cause human illness, the Commission has not been presented with evidence to suggest that this risk constitutes a barrier to the industry's environmental sustainability. This does not mean that the risk posed by pathogens could not become more severe or that more steps should not be taken to reduce that risk. Further research is needed to determine the extent to which current management practices intended to control nutrients can also control pathogens. Second, there is a need for research to identify appropriate manure-treatment strategies for Manitoba.

### Recommendation

9.13 The Manitoba government facilitate, encourage, and undertake further studies to identify:

- Practices and technologies that can further protect the environment, animals and humans from pathogen distribution from hog production. This should include determining the role played by the nitrogen and phosphorus limits governing manure application in Manitoba and studies of transfer mechanisms.
- Practices and technologies that will effectively reduce or eliminate the pathogen content in agricultural manure in Manitoba. This should include research into the effectiveness of multi-cell storage facilities and whether treatment of manure with ammonia or urea can eliminate pathogens from livestock manure in Manitoba.
- The pathogen related-risks facing hog-production workers and steps that can be taken to eliminate and reduce those risks.
- The incidence of pathogen-related illness and the connection between such illnesses and the livestock sector.
- How pathogens in manure fertilizer, particularly surface-applied fertilizer, may affect wildlife.

### Heavy metals

Studies suggest that Manitoba hog manure can contain a large number of minerals and heavy metals. The levels vary dependent upon the amount of metal that has been added to the feed and the type of hog production being carried out at any given location. Minerals can be added to feed as a growth promotant and to reduce disease.

Currently there are no federal or provincial standards for the level of heavy metals in hog manure that is applied to the soil. Research suggests that most metals are present at such low levels that it would take over a century of application for them to reach levels that present an environmental problem. However, depending on the manure, boron, copper, and zinc are present at higher levels. These metals can make a positive contribution to soil fertility if they are applied to soils that are mineral deficient. Currently, however, hog operations are not sited on the basis of the mineral deficiency of adjacent soils and manure transport costs are high. While crops do remove metals, the application of some minerals can exceed the crop-removal rates. In short, whether or not heavy metals build up in soils depends in large measure on the feed, the types of operations in the province, the soils on which the metals are applied, and the crops that are grown on those soils (Racz and Fitzgerald 2001).

Studies also suggest that applying manure at the phosphorus crop-removal rate significantly reduces the risk of a build up of heavy metals in soils (Rawluk and Flaten 2007). The presence of metal in manure can also be reduced by decreasing the metal content of feeds. This requires producers to adopt different approaches to disease management and growth promotion.

There is currently no evidence to indicate that heavy metals represent a threat to the environmental sustainability of the hog-production industry. Second, moves to reduce the application rates of phosphorus are likely to reduce the application of metals. Technologies that separate manure into liquid and solid portions also concentrate the metals in the smaller, solid portion. This allows for low-cost transportation of the metals to locations where the soils are mineral deficient.

The Commission believes that it is important to develop a better understanding of the background levels of heavy metals in Manitoba soils, particularly on fields that are being fertilized with hog manure.

#### Recommendation

9.14 The Manitoba government facilitate, encourage, and undertake further studies in the assessment of heavy metals in Manitoba agricultural soils and potential environmental effects as a result of long-term application of manure.

### 9.1.2 Manure storage

It is estimated that the Manitoba hog-production industry produces 3.8 million tonnes of manure a year (Honey, personal communication 2007). The majority of this manure is liquefied and applied on fields as fertilizer. A smaller portion is stored as solid manure (and is often composted) and applied to fields as fertilizer. Some operations do not have large-scale manure-storage facilities and therefore apply manure on a year-round basis. Operations with more than 300 animal units are banned from applying manure during winter months and (along with many operations that have less than 300 animal units) require long-term manure storage. Since 1994, the Manitoba government has mandated that earthen manure-storage facilities undergo a provincial permitting process prior to construction. A requirement for permits for concrete or steel tanks for manure storage was added in 1998. Livestock operators are prohibited from commencing construction of a new storage facility or expansion and modification of an existing facility until they have received a permit under the LMMMR. It should be noted that while these facilities are often referred to as lagoons, technically, they are not lagoons, since they are not designed to encourage treatment of the manure (although some treatment may take place). According to Manitoba Conservation, there are 675 permitted manure-storage facilities in Manitoba. Hog-production operations have permits for 540 of these facilities, while nine more facilities are operated by mixed hog and other livestock operations. Included in the 540 total are 48 concrete storage facilities and 19 steel storage facilities. In short, approximately one half of the hog operations store manure in liquefied form in permitted manure-storage facilities. Approximately 150 producers operate hoop barn structures and store their manure in dry form. As discussed below, there may be up to 800 manure storage facilities that were constructed prior to 1994, with approximately 600 of them being used to store hog manure.

Because the bulk of Manitoba manure is stored in liquefied form, the rest of the discussion of manure storage will focus on facilities designed to store liquefied manure.

## Types of manure storage systems allowed

The most common types of manure-storage facilities that are permitted are:

A) An earthen storage area with a straight cut-and-fill construction where there is adequate clay of suitable quality underlying the facility.

B) An earthen storage area with imported clay liner when adequate clay of suitable quality is hauled in from elsewhere on site or from another location.

C) A earthen-base storage area with a plastic liner, which may consist of either a polyvinyl chloride (PVC) liner of minimum .76 millimetres thickness or a high-density polyethylene (HDPE) liner of minimum 1.52 millimetres thickness.

D) A concrete storage unit that is either pre-cast or poured in-place.

E) A steel storage tank.

## Design requirements

The LMMMR requires that the design ensure that the storage facility can prevent the escape of any livestock manure that may cause pollution of surface water, groundwater, or soil. A professional engineer must undertake an initial site assessment and determine soil geotechnical characteristics as background information for the manure-storage facility design proposed. A professional engineer must sign off on documents, designs, drawings, and final certification. A minimum of three test holes, drilled to a recommended depth of not less than 9.15 metres, and the collection of soil samples for further analysis are required for earthen storages. The location and level of protection that will be required is based on information from these test holes, including type of soil, depth to water table, and estimate of soil permeability. The design of the manure-storage facility should include a site plan, capacity for present and future needs, level of protection required, laboratory results of the soil sampling from initial test holes, and other pertinent information.

## Site categories

The selection and design of a manure-storage structure varies depending on the characteristics of the site. Sites are classified as Geologically Secure, Geologically Variable or Uniform, or Geologically Sensitive.

A *geologically secure* site is one that is separated from an aquifer by five metres of low permeability material measured from the floor of the storage structure to the aquifer. This material must have conductivity no greater than $1 \times 10^{-9}$ metres per second (this is equivalent to an annual flow of 3.15 centimetres). While site-specific studies are required, these sites are usually suitable for unlined earthen storage systems. Groundwater monitoring wells and plans are usually not required.

A *geologically variable or uniform* site is one where low permeability fine-grained soils exist with interstratified coarse-grained soils that may permit appreciable water flow to or from adjacent aquifers. This category also includes areas of uniform geological formations consisting of fine-grained soils with permeability greater than $1 \times 10^{-9}$ metres per second and a minimum of five metres of overburden from the floor of the manure structure to an aquifer. In the case of a *geologically variable* formation, a suitable impervious layer must be placed between the bottom of the manure-storage structure and an existing aquifer. This may be accomplished either through the use of a one metre compacted clay or clay till layer with a permeability no greater than $1 \times 10^{-9}$

metres per second or the use of a synthetic liner. When synthetic liners are used, a venting system to prevent air and or gas build up between the earthen floor of the structure and the liner must be installed. In addition, the permit may require a groundwater-monitoring plan, including groundwater-monitoring wells.

A *geologically sensitive* site is one that contains permeable formations (coarse-grained soils) or complex geology with interbedded clay and sand or gravel strata where there is less than five metres of overburden or no overburden of low permeability material from the floor of the manure-storage structure to an aquifer. Engineered steel or concrete storage structures are usually selected for *geologically sensitive* sites. Earthen manure-storage structure options are limited and require advanced design including synthetic or composite liners, secondary containment and leachate detection systems that are placed immediately below the floor. A monitoring system including groundwater monitoring wells is required.

Facilities in the 100-year flood plain must have flood protection at least 0.6 metres higher than the 100-year flood water level (or what the director deems to be adequate protection). This does not apply to storage facilities constructed prior to 1998.

While there are no minimum capacity requirements defined in the regulation for manure storage capacity, an operator is required to have enough capacity to ensure that all of the livestock manure produced or used in the agricultural operation can be stored until it can be applied to the fields or removed from the facility. The lack of specific capacity requirements in the LMMMR was identified by the Auditor General as a limitation in the Manitoba regulation in comparison with requirements in other Canadian jurisdictions. In its response to the audit, Manitoba Conservation stated that this had been addressed through improvements in design guidelines. Manitoba Conservation technical reference guidelines specify a minimum capacity of 200 days for concrete and steel manure storages and 400 days for earthen manure-storage facilities.

### Setbacks

The regulation states that the facility must be at least:

a) 100 metres from any surface watercourse.

b) 100 metres from any sinkhole, spring or well.

c) 100 metres from the boundaries of the agricultural operation.

### Monitoring wells

There are two different sets of water monitoring requirements. The first set, the monitoring of the livestock's drinking water source, is mandatory for all operations over 300 animal units. The second set of monitoring wells can be required adjacent to manure-storage facilities. In practice, such monitoring wells are usually only required in the case of storage systems with clay or plastic liners or in-ground concrete and steel storage systems (most concrete and steel systems are above ground and no monitoring wells are required). Partially buried concrete or steel tanks have weeping tile installed around the base of the perimeter that directs seepage to a sump, which acts as a monitoring facility.

Water analysis reports from these wells must be submitted annually to Manitoba Conservation. The source water monitoring well reports are submitted to Manitoba Conservation in Winnipeg, where the information is entered into a database. This information has only been collected since 2004. The monitoring well reports are submitted to regional Conservation offices, where they are entered into a provincial database. This information has been collected since 1998.

The director may require an operator to implement a monitoring and reporting program if the director believes that the storage, handling, and management of livestock manure in the agricultural operation is causing or would likely cause pollution of surface water, groundwater, or soil.

### Requirements

An applicant for a manure-storage facility permit (who had received the appropriate municipal approvals) is entitled to a permit if:

- The proposal conforms to Manitoba Conservation's siting and construction requirements.
- There is sufficient suitable land available to the operator to implement an appropriate manure management plan.
- The construction, modification, or expansion of the manure-storage facility can be carried out in a manner that ensures that the environment is protected in the event of a structural failure of the facility.
- The construction, modification, or expansion can be carried out in a manner that ensures that the environment is protected in the case of a manure-storage facility located on land:

(A) that consists of sand and gravel,

(B) in which an aquifer exists when less than five metres of overburden having an expected hydraulic conductivity of $1 \times 10^{-9}$ metres per second or less will separate the bottom of the facility from the top of the uppermost underlying aquifer or fractured rock,

(C) that is within the unsaturated portion of an aquifer.

### Manure management prior to construction

Prior to the granting of a manure-storage facility permit, the proponent must demonstrate access to available suitable acreage for application of manure. Signed agreements with the owners, authorizing manure application to lands leased for this purpose must also be provided. Conservation expects operators to be able to demonstrate that they have access to enough land to apply manure at two-times the phosphorus crop-removal rate. The exceptions to this are in Hanover and LaBroquerie, where the amount of livestock manure produced exceeds two times the crop removal rate. In these cases, Conservation requires that the operator have enough land to apply at the one-time crop-removal rate. Manitoba Conservation will not consider land in which the phosphorus level exceeds 60 ppm phosphorus in the calculation for estimating spread land availability.

### Approval steps

The livestock manure-storage facility permit approval includes the following steps:

- A Conservation engineer makes an initial review of the completed Permit Application Form and supporting information to ensure compliance with all regulatory requirements and accepted construction standards, notes deficiencies, and assigns the application to an Environment Officer.
- The Environment Officer reviews the documentation, identifies deficiencies, and forwards all deficiencies to the applicant.
- When the applicant responds, the Environment Officer reviews the information to determine if all deficiencies have been addressed, and to see if the applicant has received municipal approval and applied for a Water Rights License (if necessary). If the application is acceptable for the site conditions, the Environment Officer drafts a permit and transmittal letter.
- The application for the permit requires the proponent to identify whether or not a TRC was prepared and to attach

a copy of the Conditional Use Permit. Manitoba Conservation verifies if the proponent has obtained relevant local approvals.

- A Conservation Engineer reviews the application and, if satisfied with the application, signs the transmittal letter and makes a recommendation to the Regional Director.
- The Regional Director reviews the application and, if satisfied with the application, signs the permit and approves the transmittal letter.
- A permit for construction (or modification or expansion) is issued to the applicant. Copies are sent to the proponent's engineering consultant, and the municipality where the storage facility is to be located.

Normally, a site visit is undertaken during the application review process.

Water Stewardship conducts a land base analysis, calculates land-base requirements for manure application, and reviews the current soil test data. Conservation also provides Water Stewardship with a copy of the draft permit for review.

Another concern raised by the Auditor General in relation to the approval process was the fact that, at the design stage, there may be considerable changes to the proposed storage capacity of the manure-storage facility. In such cases, the Auditor General stated that Conservation should be obliged to inform the relevant municipality of all significant design changes.

### Construction/modification/expansion of a manure-storage facility

Unless otherwise approved by the Director, construction must take place between May 1 and October 31, with advance notice being given to the local Environment Officer. Environment Officers and the design engineer are to carry out regular inspections during construction and upon completion of construction. The Environment Officer inspections are supposed to involve a minimum of one visit prior to construction, one visit during construction, and one visit following construction. However, the Auditor General reported that in 50 per cent of the cases reviewed there had been no pre-construction inspection and in 42 per cent of the cases there had been no post-construction inspection. The Auditor General also recommended that in future, applicants be given written inspection reports after each inspection.

Following the final inspection, a professional engineer must submit a written certification and an engineering report to the owner and to Manitoba Conservation indicating whether the construction is in compliance with the requirements of the LMMMR and that the approved design plan was followed. The operator can put the manure-storage facility into operation upon receipt of a letter from Manitoba Conservation indicating acceptance of the engineer's certification.

### Decommissioning a manure-storage facility

If livestock production is discontinued or a manure-storage facility is not in active service for more than one year, the operator is required to inform Manitoba Conservation how the integrity of the facility will be maintained or how it will be decommissioned. These plans require the approval of Manitoba Conservation. Currently, few facilities in Manitoba have been decommissioned. In the event of a decommissioning, the liquid manure and any manure solids accumulated on the floor must be removed and disposed of in a manner that complies with the LMMMR nutrient application rates. As these structures age, more of them will be decommissioned, and a detailed decommissioning policy may be required.

## Appeals of permit decisions

Under *The Environment Act*, any person affected by a permit issued by the director (or the refusal to issue a permit) or the limits, terms and conditions in a licence or permit, can make an appeal to the minister responsible for *The Environment Act*. The appeal must be made within 30 days of the granting of a permit. When a permit is granted, the rural municipal government is normally advised. Applications for permits are not public documents, and, in many cases, the only condition in the permit pertaining to the design is that the facility must be constructed as described in the application. Since 1998, there have been six appeals of manure storage permits—all from members of the public in opposition to the granting of the permit. The appeal is reviewed by a panel chaired by the Manager of the Environmental Livestock Section and includes a Manitoba Conservation professional engineer who is familiar with livestock (but was not involved in the application under review), and Water Stewardship representatives with groundwater and surface water expertise. In a report that goes to the minister, the panel determines if the regulation and procedures have been properly applied and whether there are grounds for appeal. The minister's decision on the appeal requires cabinet concurrence.

## The registration of non-permitted manure-storage facilities

In 2004, the Manitoba government required producers with non-permitted storage facilities to register their storage facilities with Manitoba Conservation by 2010. Currently the Manitoba government has received 416 applications from livestock operators for the registration of manure-storage facilities. Of these applications, 297 are for hog-manure-storage facilities. As part of the registration process, Manitoba Conservation can require an examination of the facility's integrity and proximity to surface water, surface watercourses, wells, springs, sinkholes, groundwater or other environmentally sensitive areas. It can also order the provision of environmental protection of nearby watercourses and other environmentally sensitive areas, repairs, and modifications.

The condition of these non-permitted facilities is a serious concern for the Commission. These are aging structures that were constructed at a time when there were no design requirements or approval process in place. Manitoba Conservation estimates that there may be as many as 800 non-permitted facilities. The Auditor General's report indicated that in 2005, Manitoba Conservation did not have a well-developed strategy for identifying these facilities, nor did it have a formal approval policy in place. Manitoba Conservation has since received approval to hire additional staff to assist in the registration of these facilities and has developed a formal approval process. Subsequent to their registration, these facilities will require ongoing inspection or decommissioning.

### Comment

The Commission is of the opinion that Manitoba Conservation's criteria for the siting and construction of manure-storage facilities are adequate to ensure that these facilities do not pose a threat to the environmental sustainability of the Manitoba hog-production industry. Given the significance of the role that soil permeability plays in protecting the environment, the Commissions stresses that it is essential that in approving the design for a manure storage facility, Manitoba Conservation ensure that there has been sufficient soil sampling and analysis to confirm soil permeability. The Auditor General's report noted that in the 26 files that it reviewed one proponent never submitted soil test results, one did not submit them until after the facility was put into use, and four did not meet the minimum density requirements.

The Commission does believe that there is a need for ongoing improvement in a number of areas: containment systems to provide protection against spills; maintenance and operation; inspection; and research into migration through the soils of seepage from manure-storage facilities.

### Containment systems

While such events are not common, above-ground steel and concrete storage structures may be subject to catastrophic failure with a resulting contamination of the adjacent area. Given that these structures are usually sited in sensitive areas where surface and groundwater supplies may be contaminated, it is appropriate to require that they include dyked liquid-containment areas with capacity equal to 110 percent of the capacity of the storage structure. This would be similar to the requirement for containment dykes around above-ground petroleum storage facilities.

### Maintenance and operation

Maintenance and operation are of equal importance as design and siting in ensuring the environmental sustainability of manure-storage facilities. Facilities are subject to a number of potential problems, which generally intensify over time. These include damage to liners, propensity for spills during manure handling and transfer, erosion of the compacted liner, animals burrowing in berms, tree growth in berms, and inadequate freeboard (the distance between the top of the manure and the top of the surrounding berm) (Richard and Hinrichs 2002).

Given the importance of long-term maintenance and integrity of manure-storage facilities, there should be a certification process for operators of manure-storage facilities that is similar to the current Manitoba Water and Wastewater Facility Operators Regulation under *The Environment Act*. The manure storage certification would be similar to the Wastewater Class 1 certification and include knowledge in areas of lagoon operation, odour control, testing/sampling, detention time, flow rate calculations, and emergency procedures.

Illinois is currently the only Canadian or U.S. jurisdiction that requires the certification of manure-storage facility operators. Livestock facilities with under 300 animal units are required to have at least one person certified in waste management handling. A livestock waste handling facility serving 300 or greater animal units is required to operate only under the supervision of a certified livestock manager.

### Inspection

The Commission is also of the opinion that there is a need for additional expertise in the inspection of above-ground concrete and steel manure-storage facilities. Aside from undergoing annual inspection by Manitoba Conservation staff, these facilities should be inspected every three years by a qualified structural engineer.

### Migration of contaminants through soil to an aquifer

Even with a five-metre soil thickness between the floor of a manure-storage structure and an aquifer, seepage from a manure-storage facility can reach the aquifer over an extended period of time (McMillan et al. 2001). The biggest concern is nitrogen seeping through to the groundwater. How long it will take for contaminants to reach an underlying aquifer and in what form the contaminants will be when they do reach the aquifer are important questions that require further investigation.

### *Technical Reference Manual for Liquid Manure Storage Structures*

Manitoba Conservation has produced the *Technical Reference Manual for Liquid Manure Storage Structures* as a minimum engineering guideline for the design and construction of liquid manure-storage facilities. The Livestock Manure and Mortalities Management Regulation should require compliance with the provisions of the *Technical Reference Manual for Liquid Manure Storage Structures*.

### Recommendations

9.15 The Manitoba government require that, where new above-ground steel or concrete storage facilities are located, dyking be constructed to provide a secondary containment area equal to 110 per cent of the capacity of the structure.

9.16 The Manitoba government require certification of manure-storage facilities operators, similar to the Water and Wastewater Facility Operators certification. As with Water and Waste Facility Operators, certification should be valid for five years.

9.17 Concrete and steel manure-storage structures be inspected every three years by a qualified structural engineer.

9.18 The Manitoba government facilitate, encourage, and undertake further studies with respect to migration of liquid manure seeping through the earth towards an aquifer and the resulting long-term effect on groundwater supplies.

9.19 The Livestock Manure and Mortalities Regulation require compliance with the provisions of the *Technical Reference Manual for Liquid Manure Storage Structures*.

9.20 The Manitoba government report all significant manure-storage facility design changes to the appropriate municipal authorities.

## 9.1.3 Administration and enforcement of the LMMMR

### Administration

Manitoba Conservation is charged with, among other responsibilities, enforcing the LMMMR. The Environmental Livestock Team has a total of 19 staff positions assigned to it. The Livestock Section in the Environmental Services Branch consists of five staff: a manager, a professional engineer, a professional agrologist, and two Environment Officers. This office develops policies and procedures, coordinates delivery of services, administers manure management plans and source water monitoring, and coordinates Conservation input into TRC reports.

Field delivery of the program is carried out by Regional Operations Division. There are 14 regional staff with a focus on livestock. These include three professional engineers and 11 Environment Officers. They process applications for permits, conduct inspections, respond to spills and complaints, and provide enforcement. A total of eight staff (five in Eastern Manitoba, three in Central Manitoba, and two in Western Manitoba) are assigned to inspections. In 2006, they were assisted by two staff, whose primary focus was the registering of facilities constructed prior to 1994 that do not have permits. An additional two staff positions have been created since 2006, whose primary focus is registering of facilities without permits. In recent years, there has been considerable staff turnover: as of the fall of 2007, 15 of the 19 positions were filled.

### Inspection

Manitoba Conservation Environment Officers conduct periodic inspections of all permitted manure-storage facilities. As noted above, there are 675 permitted manure-storage facilities in Manitoba. Hog-production operations operate 540 of these facilities, while mixed hog and other livestock operations operate nine more facilities. In the years immediately following construction, manure-storage systems are inspected regularly. They are then generally inspected on a risk-based assessment, but not less than once every three years. The earthen storage facilities are inspected when they are empty: with attention being paid to berm maintenance, rodent damage, berm slumping and rutting, erosion at the base, spillways and inlets, condition of ramps, and the auditing of monitoring wells. Above-ground tanks are inspected when they are full, with attention being paid to overflow, spillage, seepage or leakage, corrosion, rust, stress marks, condition of sump pumps, and monitoring wells. In 2005, 135 inspections of permitted manure-storage facilities were conducted. In 2006, 662 inspections of permitted manure-storage facilities were conducted. The inspection of all the permitted facilities identified a significant number of maintenance issues leading to an increase in facility repairs. The current goal is to inspect all operations annually, with a focus on the higher risk facilities. The Auditor General's report concluded that Conservation was not carrying out inspections in a manner consistent with a risk-based approach. The Auditor General recommended that the inspections take a broader approach to inspection, monitoring compliance with all elements of the LMMMR and municipal conditions on livestock operations, as well as inspection of the manure-storage facility.

## Enforcement

In enforcing the regulations, Manitoba Conservation takes the position that compliance is mandatory and that the regulations are to be applied with an emphasis on preventing damage to the environment and environmental health. Enforcement options available to Manitoba Conservation are:

1) **Warning**. This is a written notice that an operator is not in strict compliance with the law. The operator is given a set time period in which to take measures to bring them into compliance. The warning also indicates a date on which the operation will be re-inspected. If the operation is in compliance upon re-inspection, no further action is taken. If the operation is not in compliance, the province may issue a director's order, an offence notice, or commence a prosecution.

2) **Environment Officer Order.** In situations where there are or are likely to be unsafe conditions or irreparable damage to the environment or an imminent threat to environmental health, an Environment Officer may issue a written order to a producer to cease or modify operations. While this order expires after five days, the Director (Manitoba Conservation) has the authority to renew it.

3) **Director's Order under *The Environment Act*.** In situations where there are or are likely to be unsafe conditions or irreparable damage to the environment or an imminent threat to environmental health, under the power of *The Environment Act*, the Director (Manitoba Conservation) can issue a written order to a producer to cease or modify operations, clean or repair the area affected, or restore the environment to a satisfactory condition. The Director can specify the time period in which the order will be in effect.

4) **Director's Order under *The Dangerous Goods Handling and Transportation Act*.** Under *The Dangerous Goods Handling and Transportation Act*, the Director (Manitoba Conservation) has authority to issue a range of orders regarding the handling and disposal of dangerous goods and contaminants. If a Director's order issued under *The Dangerous Goods Handling and Transport Act* is not carried out, the Director can require that the activity be undertaken

by the department and issue an order for payment of costs.

Depending on a number of factors, including the severity of the violation and the history of the operator, the province can choose between two courses of legal action when addressing operators who violate environmental laws, regulations, and orders. These are to either issue an offence notice under *The Summary Convictions Act* or to prosecute the operator under either *The Environment Act* or *The Dangerous Goods Handling and Transportation Act*.

5) **Offence Notice under *The Summary Convictions Act*.** Environment Officers can issue offence notices under *The Summary Convictions Act* to operators who are in violation of the LMMMR. These carry set fines: $557 for individual and $2,107 for corporations.

6) **Prosecution under *The Environment* Act or *The Dangerous Goods Handling and Transportation Act*.** Individuals could be prosecuted for being in violation of these acts and their regulations, including orders issued under the acts.

The penalties for individuals are:

a) For a first offence: a fine of not more than $50,000, imprisonment for not more than six months, or both.

b) For subsequent offences: a fine of not more than $100,000, imprisonment for not more than one year, or both. In addition, the court may suspend or revoke all relevant provincial licences or permits.

The penalties for corporations are:

a) For a first offence: a fine of not more than $500,000.

b) For each subsequent offence, to a fine of not more than $1,000,000. In addition, the court may suspend or revoke all relevant provincial licences or permits.

Table 9.7 outlines the number of different types of sanctions that have been employed from 1994-1995 to 2005-2006. Table 9.8 outlines the number of Director's orders that were given since 1998. It should be borne in mind that these enforcement actions apply to more than the hog sector. Table 9.9 gives an overview of the sorts of issues that Director's Orders have addressed from 1998 to January 2007.

### Manure spills

Manure spills from storage facilities are to be reported if they involve discharge of a total volume of 10,000 litres of liquid manure or more, manure escapes from the boundary of the agricultural operation, or manure discharged into a surface watercourse, sinkhole, spring or well. If an operator voluntarily reports a manure spill Manitoba Conservation follows up with a site inspection, issues a clean-up order (if necessary), and notifies Manitoba Water Stewardship if the spill enters a surface water body. If the department is notified of a spill by a third-party, Manitoba Conservation also examines the issue to determine if prosecution is warranted. Table 9.10 outlines the number of known manure spills in Manitoba since 2003.

The two largest spills occurred in 2004:

- 5.0-million-litre spill when a pipeline ruptured.
- 4.7-million-litre spill caused by rainwater on cover.

The third largest spill was 2.3-million-litre spill in 2003 when a steel tank failed.

### Manure management plans

Approximately 500 manure management plans are registered with Manitoba Conservation each year. It attempts to audit ten per cent of these annually, selecting them on the basis of the soil test results

**Table 9.7: Sanctions 1994-95 to 2005-06.**

| Fiscal Year | Prosecutions | Warnings | Orders | Totals | Fines |
|---|---|---|---|---|---|
| 1994-95 | 5 | 15 | 1 | 21 | 1,188.00 |
| 1995-96 | 8 | 13 | 1 | 22 | 1,716.00 |
| 1996-97 | 14 | 21 | 4 | 39 | 11,010.00 |
| 1997-98 | 15 | 12 | 6 | 33 | 6,726.00 |
| 1998-99 | 12 | 32 | 7 | 51 | 11,862.00 |
| 1999-00 | 9 | 35 | 10 | 54 | 8,496.00 |
| 2000-01 | 16 | 49 | 22 | 87 | 8,067.00 |
| 2001-02 | 16 | 53 | 34 | 103 | 11,903.00 |
| 2002-03 | 15 | 59 | 21 | 95 | 20,280.00 |
| 2003-04 | 19 | 54 | 57 | 130 | 23,076.00 |
| 2004-05 | 16 | 63 | 45 | 124 | 36,960.00 |
| 2005-06 | 12 | 53 | 35 | 100 | 8,935.00 |
| TOTALS | 157 | 459 | 243 | 859 | 150,219.00 |

*Source: Manitoba Conservation.*

**Table 9.8: Director's Orders, 1998 to Jan 2007.**

| | Northeast | Northwest | Eastern | Western | Central (Interlake and Red River Valley |
|---|---|---|---|---|---|
| Engineering assessment or investigation of a manure-storage facility or confined livestock areas | 0 | 0 | 1 | 12 | 56 |
| Remediation/ clean up | 0 | 0 | 0 | 5 | 4 |
| Decommission manure-storage facility | 0 | 0 | 0 | 3 | 1 |
| Repair of manure-storage facility | 0 | 0 | 0 | 12 | 2 |
| Removal of manure | 0 | 0 | 0 | 0 | 6 |
| Mortality disposal | 0 | 1 | 0 | 11 | 2 |
| Cost recovery | 0 | 0 | 0 | -- | 0 |

*Source: Manitoba Conservation.*

**Table 9.9: Livestock Manure and Mortalities Management Regulation: Total enforcement actions 1994-1995 to 2005-2006.**

| | 1994-95 | 1995-96 | 1996-97 | 1997-98 | 1998-99 | 1999-2000 | 2000-01 | 2001-02 | 2002-03 | 2003-04 | 2004-05 | 2005-06 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Improper management of mortalities** | 7 | 9 | 9 | 7 | 11 | 12 | 14 | 28 | 18 | 31 | 46 | 25 |
| Manure escapes/ spills | 11 | 9 | 11 | 15 | 12 | 12 | 5 | 13 | 6 | 11 | 15 | 12 |
| **Operator confined livestock area in manner which causes pollution** | -- | -- | 9 | 1 | 3 | 5 | 10 | 13 | 4 | 12 | 11 | 12 |
| Fail to operate manure-storage facility in manner that does not cause pollution | -- | -- | 4 | 4 | 8 | 5 | 27 | 24 | 16 | 31 | 12 | 20 |
| **Section 6 of the LMMMR violations*** | -- | -- | -- | -- | 15 | 13 | 13 | 13 | 11 | 11 | 11 | 12 |
| Manure Management Plan Violations | -- | -- | -- | -- | -- | 4 | 12 | 12 | 40 | 22 | 20 | 13 |
| **Other** | 3 | 4 | 6 | 6 | 2 | 3 | 6 | -- | -- | 12 | 9 | 6 |

*Section 6 violations include: no permit, no approval, no engineer's certificates, failure to comply with terms of permit, failure to submit water analysis reports.

Manure management plan violations include failing to file plan, winter spreading, not applying in accordance to plan, to manure management plan, exceeding application limits, and failure to submit soil tests.

*Source: Manitoba Conservation.*

**Table 9.10: Manure spills in Manitoba.**

| Year | Spills | Major spills |
|---|---|---|
| 2003 | 23 | 2 |
| 2004 | 23 | 4 |
| 2005 | 20 | 0 |
| 2006 | 18 | 3 |
| Total | 84 | 9 |

*Source: Manitoba Conservation.*

prior to application, the recommendations of regional staff, complaints of excessive application, and random selection. All audits involve field visits and soil tests to determine compliance with the LMMMR. Table 9.11 sets out the growth in the number of plans registered with Manitoba Conservation and the number of plans that are audited annually. The Auditor General's report identified a number of shortcomings in the assessment of these plans, including missing information and soil samples from fields that did not match the fields that had been identified in the manure management plan. Of more significant concern is the fact that the Auditor General estimated that operations that are obliged to register plans are not doing so. Of the 24 operations that the Auditor General examined that were supposed to file plans, six were not doing so. The Auditor General also concluded that the audits of manure management plans were narrow in scope and the audit results were not adequately communicated to operators. In its response to the audit, Manitoba Conservation indicated that it had since established the position of Manure Management Planning Coordinator and was addressing these issues.

The Commission notes that fewer than half of Manitoba hog producers are currently registering manure management plans. These plans are key documents for the sustainable management of manure. For this reason, the Commission will be recommending that all new, modified, or expanding Manitoba hog-producers be required to register manure management plans.

**Table 9.11: Manure management plans registered and audited 2001-2006**

| Crop Year | Manure management plans registered | Manure management plans audited |
|---|---|---|
| 2001 | 236 | 15 |
| 2002 | 284 | 0 |
| 2003 | 336 | 56 |
| 2004 | 357 | 8* |
| 2005** | 458 | 46 |
| 2006 | 488 | 33 |

* The 2004 audit was suspended in the early stages because of a change in regulatory requirements pertaining to nitrate nitrogen.

** Prior to 2005, operations with 400 animal units or more were required to file manure management plans. From 2005 onward, operations with 300 or more animal units were required to file manure management plans.

*Source: Manitoba Conservation.*

The Commission notes that the staffing rates for enforcement have increased significantly in recent years. It is also the case that the industry has expanded dramatically during this period. As the manure-storage facilities that were put into operation in the past decade age, there will be a need for increased monitoring and communication with operators. Therefore, it is important that the government ensures that sufficient staff and resources are available for necessary inspection and follow up.

### Recommendations

9.21 The Manitoba government continue its policy of having Manitoba Conservation Environment Officers inspect all licensed manure-storage facilities on an annual basis with a priority being given to the high-risk operations.

9.22 The Manitoba government require all new, modified, or expanding hog-production operations to register manure management plans.

9.23 The Manitoba government ensure that Manitoba Conservation has sufficient resources to assess proposed hog-production operations, inspect existing operations on an annual basis, audit 10 per cent of manure management plans annually, register non-permitted manure-storage facilities, and enforce existing manure-management regulations.

## 9.2 Water use

As noted in Chapter 6, hog-production operations require water for hogs to drink, for maintenance, and to flush manure to storage systems (in the case of operations that use liquefied manure storage systems). This water use can be a barrier to sustainability if it threatens local or regional water supplies or if excess water use exacerbates the cost of transporting manure and contributes to imbalances in the nitrogen-to-phosphorus ratio in manure. While the Commission has concluded that the current rate of water use by the hog-production industry is likely environmentally sustainable, the Commission believes that the Manitoba government needs to further develop its water-use monitoring in order to ensure long-term sustainability of the resource.

### 9.2.1 Water allocation to hog producers

Water is a provincial Crown resource. Under *The Water Rights Act* (1980), all water use, except for domestic purposes, requires either a licence or authorization from the Water Stewardship Department. The provincial government allocates water for beneficial use without wastage. Beneficial uses are defined as Domestic use, Municipal use, Industrial use, Agriculture use, Irrigation, and Other purposes (such as aquaculture, fire protection, and recreation). Manitoba's 1,200 hog-production operations have water allocated to them in one of two ways: either as a part of their domestic allocation or through a water rights licence that has been issued for agricultural use.

Applicants for a water rights licence must identify the intended use, the annual withdrawals and the flow rates, construct preliminary works, and conduct a series of tests and analyses. The proponent may be required to submit a project assessment that addresses the following questions.

- Can a well or wells of sufficient capacity be developed to provide the required water supply?
- Will the groundwater for this project result in negative impacts to other groundwater users in the area in either the short or long term?
- Can the aquifer sustain the required supply without depleting the groundwater resource or causing a deleterious environmental effect over the long term?

There are similar questions that have to be addressed in the licensing of surface consumption.

Terms and conditions of a water rights licence are developed on a site-by-site basis but typically can include:

- Limitation on specific uses for the water. For livestock, the annual allocation is determined by the size and type of livestock operation. Matching the allocation in this way is viewed as a barrier to waste.
- Limitations on the total volume of water that may be withdrawn.
- Limits on the maximum depth to water in the aquifer, below which further groundwater withdrawals cannot occur.
- A requirement that the licensee must correct any problems with the existing water supplies that are attributable to the withdrawal of water authorized by the license.
- A requirement for a water measuring device that will accurately measure flow and volume of water withdrawn.

Licences cost $50, are issued for a period of time to a maximum of 20 years, and may be renewed upon application.

While all holders of water rights licences are required to report their water consumption on an annual basis, the province does not record or aggregate these readings to ensure that operators are not exceeding their licensed amount. Manitoba Water Stewardship does check the meter when an operation is expanding or changing ownership and reports that, in almost all cases, the amount of water used conforms to the licence.

### Domestic use

Domestic use means the use of water obtained from a source other than a municipal or community water distribution system, at a rate of not more than 25,000 litres per day, for household and sanitary purposes, for the watering of lawns and gardens, and the watering of livestock and poultry. There is no requirement for a licence or the metering, reporting, or recording of the level of water use.

### Agricultural purposes water rights licence

One of the categories of water rights licence is a license for Agricultural purposes. Manitoba Water Stewardship defines agricultural purposes as the use of water at a rate of more than 25,000 litres per day for the production of primary agricultural products, but does not include the use of water for irrigation purposes. In reality, the water allocated under these rights is used by livestock operations. The Manitoba government grants two types of Agriculture water rights licence: one for withdrawal of surface water and one for the withdrawal of groundwater.

As of October 2007, there were 342 valid Agriculture water rights licences (307 groundwater licenses and 35 surface water licenses.) Table 9.12 outlines the number of licenses that have been granted for livestock operations from 2001-2006.

**Table 9.12: Livestock water rights licensing activity 2001-2006.**

| Year | Surface Water Licences | Groundwater Licences |
|---|---|---|
| 2001 | 2 | 58 |
| 2002 | 4 | 32 |
| 2003 | 4 | 5 |
| 2004 | 1 | 34 |
| 2005 | 4 | 44 |
| 2006 | 4 | 53 |
| Total | 19 | 226 |

*Source: Manitoba Water Stewardship.*

Manitoba Water Stewardship does not keep a tally of the number of hog operations that have received water rights licences. However, it estimates that hog producers account for approximately 80 per cent of the licences (approximately 270 licences). The Manitoba Pork Council told the Commission that, based on Manitoba Water Stewardship records, 4,440 cubic decametres of groundwater had been allocated to the hog industry under 215 water rights licences. This figure excluded groundwater allocated to mixed-use sites (sites with both domestic and general livestock uses) and surface water resources specifically allocated to hog production (which the Council stated to be a minor component of the total volume). These figures suggest that between 215 and 270 Manitoba hog producers have been allocated water rights licences. If this is correct, approximately 1,000 of the province's 1,280 producers provide for the animals' water needs under their domestic allocation.

### Water sources

While groundwater is an important source of water for the hog-production industry, water may also be obtained from regional pipelines and surface water sources. The industry often uses small, untapped aquifers and intermittent streams. In the Red River Valley, where water can be hard to come by, licences have been issued to hog operations that pump water during the spring runoff period from the drainage channels.

### 9.2.2 Water consumption

A report prepared for the Commission stated "any attempt to estimate water usage by Manitoba hog operations is a daunting task given the lack of sufficient information" (Nyachoti et al. 2007, 107). Manitoba Water Stewardship's policy of not recording the reported meter readings, coupled with the large number of operators that are not licensed, makes it difficult to get a firm grasp on the amount of water the hog-production sector consumes.

## Calculations based on water licenses

Manitoba Water Stewardship has allocated 8,220 cubic decametres of groundwater for Agriculture Purposes. This amounts to 7.3 per cent of total groundwater allocations. It has also allocated 1,334 cubic decametres of surface water for Agriculture Purposes. This amounts to 0.3 per cent of surface water allocations.

The 9,554 cubic decameter figure represents the amount of water allocated to the agriculture sector, it is not a report on the amount of water used. Furthermore, it does not include the amount of water that is used to produce hogs by those hog-production operations using water from their domestic allocation. While there are a large number of such operations, they are likely to account for a small portion of production.

In 1987, the Manitoba government began levying fees for users who are licensed under the Industrial and Other Use categories. The purpose of the fees was to make major users more aware of their rate of consumption and to encourage conservation.

It is estimated that there are 2.9-million hogs in Manitoba at any one time: 372,700 breeding stock, 1.1-million nursery hogs, and 1.4-million grower/finisher hogs. Given that there are estimates for water use per hog, it is possible to estimate water use based on these numbers. There is an important caveat that needs to be placed on such an estimate, namely that the water-use estimates are subject to considerable variability due to the differences between operations. The same variability applies to estimates as to the amount of water needed for cleaning and flushing of barns. A paper prepared for the Commission used water-use estimates to produce the summary of the total daily water usage of Manitoba hogs found in Table 9.13.

**Table 9.13: Total water usage by hog inventories in Manitoba, April 1, 2007.**

| Hog type | Number of hogs | Water usage (litres per day) |
|---|---:|---:|
| Breeding stock | 372,700 | 9,895,185 |
| Nursery | 1,110,800 | 4,221,040 |
| Grow-Finish | 1,436,500 | 16,807,050 |
| Total | 2,920,000 | 30,923,275 |

*Source: Nyachoti et al. 2007.*

The figure of 30,923,275 litres a day converts to 30,923 cubic meters a day or 30.9 decametres a day or 11,278.5 cubic decametres a year. This figure is nearly three times the amount that the Manitoba Pork Council estimates to be allocated to the industry and also higher than the total amount that Manitoba Water Stewardship states is allocated for agricultural purposes, which includes all specifically licensed livestock and poultry operations. Given the fact that Manitoba Water Stewardship does not have data on water use, as opposed to allocation, it is difficult to determine if the resource is being managed to maximize its sustainability.

There is a need for Manitoba Conservation, Water Stewardship, and the industry to work together to determine an accurate volume of water used by the industry. This should include the following:

- Reading of meters by Manitoba Conservation at the time of annual inspections.
- Comparison of meter readings with allocated amounts for a period of time to be determined.
- Research into the use of water by function.
- Amount of water used by small operations for purposes of hog raising.
- Amount of licensed water used by large mixed farms specifically for their hog operations.

Once the foregoing information is available, a reliable understanding of the volume used by the industry by function can be determined. This information can then be used to maximize the efficiency of water use.

### Reducing water use

There are a number of management practices that can be adopted to reduce water usage in the hog-production industry. These include:

- The amount and composition of the hog diet.
- The design and construction of the units from which hogs drink (drinkers).
- Animal management (bored and closely confined hogs drink more).
- Recovery and recycling of wastewater.
- Technologies that move waste with less water.
- Solid manure housing systems (in which the solid manure is not liquefied).

According to the study prepared for the Commission, some of these approaches are still in development stages and may not be economically viable. In other cases, there is little data on the degree to which new technologies have been adopted (Nyachoti et al. 2007).

One method of reducing use is demand management through price increases. The cost of water varies in many jurisdictions in Manitoba, and good arguments can be made that, in some locations, increases in the price of water could provide a greater incentive to conservation. However, the intensive hog-production industry must shoulder the cost of storing the water after use in the form of liquid manure and then of applying the water to the land. From the disposal perspective, if the operation is complying with all existing manure and nutrient management regulations, there exists a considerable economic incentive to reduce and control water use. Therefore, at this point, the Commission is not recommending that any additional water-use fees be contemplated.

### Comment

The Commission recognizes the need to conserve and protect water quality and quantity and the legitimacy of using water as a factor of production in a sustainable manner. The Commission also supports the goals of Manitoba's 2003 Water Strategy, which emphasize watershed planning, benchmarks for sustainable withdrawals, and the potential of demand management.

The Commission is satisfied that Water Stewardship undertakes the appropriate work in determining whether or not to grant a water licence to a hog-production operation. Furthermore, the Commission notes that the livestock sector is assigned 7.3 per cent of total groundwater allocations, 0.3 per cent of surface water allocations, and 1.3 per cent of total water allocations. The Commission further recognizes that the need to dispose of the liquefied manure provides producers with an incentive to control water usage.

These observations are balanced by the Commission's concern over the lack of strong data as to the amount of water that the livestock sector consumes. Future policy and planning will require stronger data on water use. While it would appear water resources are being managed in a sustainable manner, the Commission believes that stronger data are required before a more confident assertion can be made about the sector's sustainability.

### Recommendations

9.24 The Manitoba government obtain accurate data on livestock water sources, quality, and usage. This would include the reading of meters at livestock operations by Manitoba Conservation Environment Officers at the time of inspection of manure-storage facilities, the comparison of meter readings with allocated amounts, and the publication of annual summaries of use versus allocation for each sector.

9.25 The Manitoba government compile information on technologies that reduce water usage without compromising animal performance and make this information available to producers.

9.26 The Manitoba government facilitate, encourage, and undertake further studies into water use, water wastage, and water use reduction technologies and practices. This should include:

- The use of water by genotype, production phase, environment and health status.
- The amount of water used by unmetered operations engaged in hog production.
- Animal management strategies and animal housing designs that minimize water usage and wastage and therefore reduce manure volume.
- Waste water recycling for existing operations that may not be able to significantly reduce water use because of design.
- Hog rations that minimize excess nutrients and mineral intake, thus influencing water intake as well as manure output.

# 10 Air quality

The Commission has identified two potential environmental sustainability issues relating to the emissions that come from hog-production: climate change and odour.

## 10.1 Climate Change

Agriculture produces three main greenhouse gases: carbon dioxide, methane, and nitrous oxide. While carbon dioxide is the most common greenhouse gas, it is not the most potent. Methane is 21 times more potent than carbon dioxide, while nitrous oxide is 310 times more potent. It is common to convert all emissions to carbon dioxide equivalents for ease of comparison.

In 2005, it was estimated that Canada's greenhouse-gas emissions were 747,000 kilotonnes of carbon dioxide equivalency, while Manitoba's emissions were 20,300 kilotonnes of carbon dioxide equivalency (2.1 per cent of the national total). On the national level, agriculture contributed 57,000 kilotonnes of carbon dioxide equivalency (8 per cent of the national total). Manitoba agriculture contributed 6,000 kilotonnes of carbon dioxide equivalency (0.8 per cent of the national total).

Livestock-related greenhouse-gas emissions represent approximately 68.2 per cent of total emissions from Manitoba agriculture. There are four livestock-related agricultural sources of greenhouse gases in Manitoba: enteric fermentation (fermentation taking place in the intestinal system), manure management, manure applied as fertilizer, and manure deposited on pasture land. Table 10.1 provides a break down of the source of livestock greenhouse-gas emissions in Manitoba.

**Table 10. 1: Manitoba greenhouse-gas emissions related to livestock.**

| Source of emission | Greenhouse gas | Per cent of total Manitoba agriculture greenhouse-gas emissions |
|---|---|---|
| Enteric fermentation | Methane | 41.5 |
| Manure management | Methane and nitrous oxide | 15.9 |
| Manure applied as fertilizer | Nitrous oxide | 3.2 |
| Manure on pasture | Nitrous oxide | 7.6 |
| | Total | 68.2 |

*Source: National Inventory Report 1990-2005 – Greenhouse Gases and Sinks in Canada (Environment Canada, 2007).*

Enteric fermentation from cattle (dairy and non-dairy) accounts for the greater part of the all agriculture greenhouse gas emissions at approximately 39 per cent (hogs account for approximately 4 per cent of the enteric emissions from Manitoba agriculture or 1.5 per cent of the total greenhouse gas emissions from agriculture). The major hog-related greenhouse-gas emissions are calculated under the manure-management category. Hogs account for approximately 33 per cent of emissions related to manure management (approximately 5 per cent of the overall emissions from Manitoba agriculture). The manure on pasture category in Table 10.1 refers to manure deposited by animals that are being fed on pastureland ; hog manure does not account for any significant portion of these emissions. According to Manitoba Agriculture, Food and Rural Initiatives (MAFRI) calculations, in 2005, hog production in Manitoba was responsible for approximately 6 to 8 per cent of the greenhouse-gas emissions from Manitoba agriculture.

While the hog industry is not a major contributor to climate change, the industry's contribution can be reduced by the use of synthetic covers on manure-storage facilities and the injection or incorporation of manure when it is applied to land. These methods not only reduce greenhouse-gas emissions by 40 to 80 per cent, they can improve the nitrogen to phosphorus ratio in manure (both in storage and in application), reduce the risk of nitrogen and phosphorus loss, and reduce odour concerns. (See Table 10.2 for estimates of the nitrogen losses to the atmosphere associated with different application methods.) For all these reasons, the Commission is recommending that new operations be required to utilize synthetic covers and inject or incorporate manure within 48 hours. The Commission recognizes that in order to meet the conditions of the coming ban on winter application many smaller operators are going to have to construct manure-storage facilities. The Commission believes that the Manitoba government has a responsibility to these producers to assist in the construction of these facilities, assuring that they have appropriate covers.

### Recommendation

10.1 The Manitoba government require that all new manure-storage facilities have synthetic covers (ideally negative pressure covers).

10.2 The Manitoba government require all new and expanding operations to either inject or incorporate manure, with incorporation taking place within 48 hours.

**Table 10.2: Volatilization losses (%) associated with different application Methods and weather conditions.**

| Application details | Average | Cool wet | Cool dry | Warm wet | Warm dry |
|---|---|---|---|---|---|
| **Injected** | **0%** | **0%** | **0%** | **0%** | **0%** |
| Incorporated within 1 day | 25% | 10% | 15% | 25% | 50% |
| **Incorporated within 2 days** | **30%** | **13%** | **19%** | **31%** | **57%** |
| Incorporated within 3 days | 35% | 15% | 22% | 38% | 65% |
| **Incorporated within 4 days** | **40%** | **17%** | **26%** | **44%** | **72%** |
| Incorporated within 5 days | 45% | 20% | 30% | 50% | 80% |
| **Not incorporated** | **66%** | **40%** | **50%** | **75%** | **100%** |
| Irrigated | Above +10% | Above +10% | Above +10% | Above +10% | Above +10% |
| **Standing or Cover Crop/ Stubble** | **35%** | **25%** | **25%** | **40%** | **50%** |

*Adapted from Tri-Provincial Manure Application and Use Guidelines.*

## 10.2 Odour

Odour is one of the major issues that residents are likely to raise when they are informed that a hog-production facility may be established in their community. While the Commission only heard a limited number of specific complaints about hog-facility odour, those concerns were clearly heart-felt and real. People spoke of being confined in their homes by a wall of odour and being unable to enjoy their property during the summer.

The odour issue has been at the centre of many conflicts relating to the hog industry for over three decades. In 1973, when the Manitoba government exempted a Manitoba hog-production facility from a Clean Environment Commission order to reduce the number of hogs on the operation and lower the odour emissions, the decision was justified with the argument that "the present state of scientific knowledge concerning the control of odours from livestock operations is insufficient to formulate specific limits for odours other than on an arbitrary basis" (Wilson 1975).

In its 1979 report on the intensive livestock industry in Manitoba, the Clean Environment Commission made three comments relating to odour. The first was that while "some offensive odour is normally associated with livestock production operations…livestock odours can be a substantial nuisance to those not engaged in the production operation." The most effective way of addressing this (beyond good housekeeping and effective manure management) was "to introduce a considerable separation distance between livestock operations on the one hand and residential or commercial land use on the other." While the odour issue is often framed as a conflict between farming and non-farming rural residents, the Commission observed that most of the odour complaints "came from people who are agricultural producers" (Clean Environment Commission 1979, 5). *The Finding Common Ground* report stated "The challenge facing the Panel was to separate largely emotional reactions to the nuisance of odours from genuine health hazards. We attempted to 'get a handle' on the science, but found it an extremely complex area with woefully inadequate research" (Livestock Stewardship Panel 2000, 32). The Panel, for example, questioned why in placing setbacks, municipalities rarely exceeded the provisions in the *Farm Practices Guidelines.*

There are four main potential sources of odour from most intensive hog-production operations:

- Building exhaust.
- Manure storage.
- Land application.
- Mortality disposal.

Research suggests that mortality disposal is not an odour problem in Manitoba. However, the other three sources can be problematic.

### 10.2.1 Manitoba regulations

The two most effective ways to deal with odour are through good municipal planning and good on-farm maintenance and operating practices. In Manitoba, municipal planning takes place in a context developed by the provincial government, while the provincial Farm Practices Protection Board is intended to ensure that hog operations adhere to established farm practices. The next two sections of this chapter deal with those issues.

#### Municipal planning

The provincial government is requiring municipalities to establish livestock operating policies by 2008. These policies will outline various zones within a municipality and indicate whether they are appropriate for livestock development. This planning measure could play a role in limiting future odour-related issues.

Beyond that, at the approval stage, rural municipalities have the authority to require operations to cover their manure-storage facilities, to construct shelter belts and to situate their operations a set distance from residences and designated areas (urban centres, settlement centres, rural residential, seasonal residential areas,

**Table 10.3: Minimum separation distances for siting livestock operations.**

| | **Separation distance in metres (feet) from single residence** | | **Separation distance in metres (feet) from designated areas** | |
|---|---|---|---|---|
| **Size of Livestock Operation in animal units** | **To earthen manure-storage facility** | **To animal-housing facility and non-earthen manure-storage facility** | **To earthen manure-storage facility** | **To animal-housing facility and non-earthen manure storage facility** |
| 10 – 100 | 200 (656) | 100 (328) | 800 (2,625) | 530 (1,739) |
| 101 – 200 | 300 (984) | 150 (492) | 1200 (3,937) | 800 (2,625) |
| 201 – 300 | 400 (1,312) | 200 (656) | 1600 (5,249) | 1070 (3,511) |
| 301 – 400 | 450 (1,476) | 225 (738) | 1800 (5,906) | 1200 (3,937) |
| 401 – 800 | 500 (1,640) | 250 (820) | 2000 (6,561) | 1330 (4,364) |
| 801 – 1,600 | 600 (1,968) | 300 (984) | 2400 (7,874) | 1600 (5,249) |
| 1,601 – 3,200 | 700 (2,297) | 350 (1,148) | 2800 (9,186) | 1870 (6,135) |
| 3,201 – 6,400 | 800 (2,625) | 400 (1,312) | 3200 (10,499) | 2130 (6,988) |
| 6,401 – 12,800 | 900 (2,953) | 450 (1,476) | 3600 (11,811) | 2400 (7,874) |
| >12,800 | 1000 (3,281) | 500 (1,640) | 4000 (13,123) | 2670 (8,760 |

*Source: Manitoba Provincial Land Use Policies.*

parks, recreational areas, existing land uses in the area). These setbacks must be at least the minimum distances prescribed in the Provincial Land Use Policy for agriculture. The setbacks are set out in Table 10.3.

The shelterbelts and the setbacks relate to the location of the barn and manure-storage facility, but do not apply to the fields on which manure is applied. Coverage of manure storage units relates, obviously, only to manure storage. None of these measures control odours when manure is applied to fields or protect residents from those odours.

Prior to the adoption of *The Planning Act* in 2005, these separation distances were recommended in the Manitoba Farm Practices Guidelines. Municipalities have made it clear that they wish to retain the authority for granting conditional-use permits and placing conditions that mitigate the odour from livestock operations. However, the Commission has heard from both large and small municipalities that they lack the financial resources to enforce their bylaws and from residents who believe their councils lack the political will to enforce their bylaws. In one case, rather than enforce its own bylaw, a rural municipality filed a complaint with the Farm Practices Protection Board. This issue was further complicated by recent amendments to *The Municipal Act* that removed residents' right to go to the courts to have bylaws enforced.

### Farm Practices Protection Board

Residents with complaints about odour from livestock operations can take their complaints to the Farm Practices Protection Board (FPPB). The FPPB is charged with determining if the issue arises from a normal farm practice or not. If it does not arise from a normal farm practice, the FPPB can issue an order requiring the operator to modify the practice. Table 10.4 breaks down the complaints received by the FPPB by category and how they were disposed of.

The following points can be made about the information in Table 10.4.

- 77 per cent of all complaints related to odour.
- 65 per cent of all complaints related to hog odour.
- 69 per cent of all hog odour complaints led to orders that the operator either modify or cease their practice. This amounts to 77 per cent of all orders to modify or cease practices issued by the Board.

There has been a significant drop off in the number of complaints filed with the Board: in 2000-2002, 36 complaints were filed. In 2006, three complaints were filed.

In its orders relating to hog production odour, the Board has typically:

- Ordered the covering of manure storage-facilities (usually with straw).
- Ordered the planting of shelter belts.
- Ordered the incorporation of manure when it is being applied to fields.

The Board's record is in many respects quite admirable. The following comments relate not to the way the Board has conducted its business, but to its legislative powers and limited resources.

The Commission has identified the following concerns with the FPPB's policies and authority:

- Complainants are required to deposit $50 when filing a complaint. The $50 is returned, unless the FPPB rules that the issue under complaint arose from a normal farming practice. Over 13 years, there have only been seven cases where the Board had declined to return the applicant's $50. The Commission believes the deposit is an unnecessary and illogical deterrent that punishes those applicants who were mistaken as to whether the practice was or was not considered normal. It should be noted that the FPPB has never had to exercise its right to dismiss cases that it believed to be frivolous or vexatious.

- The staff who inspect operations to see if FPPB orders are being complied with have no order-making powers. Each year, MAFRI staff inspect operations with orders against them to see if they are in compliance. This is of particular significance in the case of operations required to cover manure-storage facilities with straw, since the covers have to be reconstructed each year. MAFRI staff have no enforcement powers and simply prepare reports for the Board as to the level of compliance.

- The FPPB has limited ability to enforce its decisions. The Board can file its orders with the court and also apply for a court order to have the order complied with. These are both cumbersome and time-consuming steps and the Board has not undertaken them to date. In 2007, some operators who were required to cover their earthen manure-storage facilities were unable to do so because they could not get access to sufficient dry barley straw to provide a full cover for the facility. In these cases, the Board sent the operators letters telling them that they must conform to Board orders in 2008. Complainants cannot go to court to have a Board order enforced, although they can initiate a nuisance suit after the FPPB has dealt with their complaint. To date, no complainant has initiated a nuisance suit.

- The PPB has a relatively low profile. Some people may not be aware of its

**Table 10.4: Types of complaints received by Farm Practices Review Board and resolution of the complaint.**

| | Modify | Reconsidered/ further modify | Cease | Mediated/ Withdrawn | Dismissed because the operator was conducting activities in a normal manner. | Refused to hear because outside mandate | Pending |
|---|---|---|---|---|---|---|---|
| Noise | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Dust | 1 | 0 | 0 | 0 | 0 | 1 | 0 |
| Spray | 3 | 0 | 0 | 1 | 1 | 0 | 0 |
| Smoke (to protect horses from insects) | 4 | 0 | 0 | 1 | 0 | 1 | |
| Wild Boar | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Odour Hogs | 32 | 5 | 1 | 7 | 4 | 0 | 0 |
| Odour Dairy | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Odour Beef | 1 | 0 | 0 | 2 | 1 | 0 | 1 |
| Odour Crop | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| Others | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | 42 | 5 | 1 | 15 | 7 | 4 | 1 |

*Source: Manitoba Farm Practices Review Board.*

existence. Even when they are aware of its existence, some people may not be fully aware of how the Board operates. For example, the Commission was told by some rural municipalities that the Board does not accept complaints from municipalities, when, in fact, it does. This could be due to a number of reasons: a prime one would be the Board's very modest budget, which makes it difficult for it to undertake outreach work.

### 10.2.2 Mitigation strategies

There are a number of strategies that can be adopted to reduce odour impacts. These include:

- *Proper ventilation and maintenance of barns.* The Commission has reviewed reports that suggest biofilters can reduce odour emissions from barns. The Commission notes that no branch of the provincial government appears to be reviewing the ventilation systems of new or expanding barns before they are constructed, nor are there requirements that have to be met before a barn is put into operation.

- *Adequate separation distances.* While odour plumes (the distance at which odour can be detected) may extend beyond the current setback distances, at those distances, the odour, while detectable, would be below the nuisance level. Manitoba's setbacks appear to provide at least as much protection as is provided in comparable jurisdictions.

- *Manure-storage covers.* Synthetic covers are reported to reduce odour to almost nil. The impact of straw covers, while significant is far less effective. Furthermore, the straw covers do not always operate at maximum capacity due to a wide range of issues, including partial coverage and the eventual submersion of the straw. Synthetic covers also reduce nitrogen loss, leading to more efficient nutrient use.

- *Dietary manipulation.* Improvements in the uptake of phosphorus and nitrogen can reduce the level of nutrients in manure and reduce odour.

- *Solid and liquid separation.* The separation of solids from liquids in manure can make it possible to better control odour.

- *Shelterbelts.* The evidence suggests that shelterbelts, which provide numerous other environmental benefits, can provide limited benefit in reducing odours. This has to be balanced with the fact that it may take many years before they reach maturity and provide their optimum benefit.

### 10.2.3 Information gaps

A literature review commissioned by the Commission for this Investigation concluded that while odours, for the most part, are not direct threats to human health, they could trigger a variety of health problems. Given the difficulties in measuring concentrations downwind from hog operations, the researchers did not believe that methods used for regulating industrial pollutants were appropriate in regulating the odour from intensive livestock operations. The paper identified a number of weaknesses with the Manitoba regime for monitoring and assessing odour-related issues. In particular, it concluded that there was a need for:

- Standards and procedures for measuring odour emission from barns and manure storage in Manitoba. These should cover the assessment of odour downwind from livestock operations.

- A dispersion-theory-based guideline, integrated with odour-impact models, should be established in Manitoba. Such a guideline would give consideration to the various factors that affect odour emission and dispersion, including topography and technology.

The review identified the need for additional information in the following areas:

- Potential health effects associated with odour downwind from hog operations. These are needed to establish suitable acceptability criteria for community level exposure to odour.
- Emission rates and characteristics of odour from hog operations.
- Downwind distribution of odour and other air contaminants.
- Economic analysis of odour mitigation technologies for Manitoba conditions (Zhang et al. 2007).

### Comment

For those who are affected by it, the odour from hog production operations is a very serious problem. As noted above, it may, unless properly mitigated, contribute to a variety of health problems. Properly managed, however, it should not be a barrier to the industry's environmental sustainability. If it is not properly managed, the industry's social sustainability will be seriously challenged. The Commission also notes that its recommendation requiring synthetic covers for all future manure-storage facilities and to have all new and expanding operations either inject or incorporate manure will significantly reduce the number of future odour complaints.

### Recommendations

10.3 The Farm Practices Protection Board cease requiring complainants to place a $50 deposit when they file a complaint.

10.4 Manitoba Conservation Environment Officers be given the authority to enforce orders of the Farm Practices Protection Board under their powers under *The Environment Act.*

10.5 The budget of the Farm Practices Protection Board be increased to allow it to undertake more outreach work to make members of the public aware of its services.

10.6 The Manitoba government establish a dispersion-theory-based farm odour guideline. Such a guideline would give consideration to the various factors that affect odour emission and dispersion including topography and technology.

10.7 The Manitoba government facilitate, encourage, and collaborate on the research and data collection in the following areas:

- Standards and procedures for measuring odour emission from barns and manure storage in Manitoba.
- Potential health effects associated with odour downwind from hog operations. These are needed to establish suitable acceptability criteria for community level exposure to odour.
- Emission rates and characteristics of odour from hog operations.
- Downwind distribution of odour and other air contaminants,
- Economic analysis of odour mitigation technologies for Manitoba conditions.

# 11 Flora and fauna

The Commission has identified two key issues in assessing the environmental sustainability of the hog-production industry in its relation for flora and fauna. These are:

- Impacts on biodiversity.
- Health impacts (including worker safety and health, animal diseases, and antibiotic use).

## 11.1 Biodiversity

One of the principles of Sustainable Development stresses "the importance of conserving and enhancing natural eco-systems and other ecological resources." The expansion of agriculture, which seeks to produce large quantities of uniform commodities, can place increased pressures on biodiversity. The two potential biodiversity impacts that the Commission identified are:

- The threat to biodiversity that arises when natural habitat is brought into production to serve as agricultural land on which manure can be applied.
- The impact of increased nutrient levels in the soil on environmentally sensitive areas.

### 11.1.1 Conversion of natural habitat

The major impact of the livestock industry globally on biodiversity has arisen from the conversion of natural habitat into cropland to provide the required feed for the expanding livestock sector (Steinfeld et al. 2006). The intensification of the hog-production industry of the past fifteen years has not led to a significant increase in cropland in Manitoba. Indeed, one of the main reasons for the expansion was to find a market for grain that was already being grown in the province but could not be economically exported. Many hogs are now raised in operations that are exclusively devoted to hog production. In addition, most large-scale producers store their manure in liquid as opposed to solid form. For these operators there can be a need to have access to additional agricultural land on which to apply the manure that is a by-product of hog production.

The issue of the lack of access to land is intensified by the trend in intensive livestock production for production operations to cluster in specific regions. For example, in Manitoba, where feed companies have played a role in developing the industry, the industry has become geographically clustered. This allows for considerable control of costs, but can also increase the need to put marginal lands into production to provide the needed spread acres.

The Canada Land Inventory, as administered by Agriculture and Agri-foods Canada, has developed a national soil classification system that classifies land by its agricultural capability (Table 11.1). Lands capable of sustained production of common field crops are categorized as either Class 1, 2, or 3. It is generally accepted that all the Class 1, 2, and 3 lands available in Manitoba are already in agricultural production, for the most part in annual crop production. This means that if more land is to be brought into production, it will be on the marginal soils of Classes 4, 5, and 6. These soils are usually shallow and/or permeable.

**Table 11:1: Agriculture and Agri-food Canada soil classifications.**

| Soil class | Capability |
|---|---|
| Class 1, 2 and 3 | Capable of sustained production of common field crops |
| Class 4 | Marginal for sustained arable agriculture and should be in permanent forage production |
| Class 5 | Suitable only for improved permanent pasture |
| Class 6 | Capable only for native pasture use |
| Class 7 | Incapable of use for arable agriculture or permanent pasture |

*Source: MAFRI.*

Because there is so little undeveloped Class 1, 2, or 3 soils left in Manitoba, producers have been putting natural habitat or undeveloped land into crop production to increase the available spread acres. In other cases, they might spread manure on pasture or forage land that traditionally would only receive synthetic fertilizers on a limited basis.

The clearing of woodlands, draining wetlands, and changing the character of the soils and grasslands has a direct effect on the species living in these habitats and on the surrounding area. In many cases, these marginal areas are the last refuge for wild flora and fauna, since few wildlife species can survive on cultivated fields. The margins that are available to them, such as fencerows, field margins, missed corners and old farmsteads, are becoming increasingly rare as farm equipment becomes more efficient. These habitats are essential to the maintenance of biodiversity in a local area (McLaughlin and Mineau 1995).

For these reasons, the Commission is of the view that these lands should not be brought into production to serve as potential fields for the application of manure. The long-term agronomic benefit of applying manure to this land is still in question, while the potential environmental risks may be significant.

One of the weaknesses with the current approval and permitting process is that there is no analysis done of a proposed project's potential impact on the local ecosystem or regional biodiversity. There is no examination of, for example, the ecological implications of converting natural lands or wetlands to fields for the application of manure, locally or downstream. The Commission is of the opinion that the Manitoba government should include biodiversity considerations into its decision-making process both in regard to expansion in the livestock sector and significant changes in land use. By considering these issues, it may be possible to reduce future nuisance problems such as crop depredation and regional loss of biodiversity as a result of habitat loss or fragmentation.

### 11.1.2 The impact of increased nutrient levels in environmentally sensitive areas

In addition to the biodiversity impacts that result from changes in land use, the Commission is also concerned about changes that can arise from increased nutrient levels in the soil. Such increases in a region can have an effect on biodiversity. The plant growth that is native to much of the Canadian prairie can survive with limited access to available nitrogen and phosphorus. Established native grasslands or other habitats should never be fertilized (although fertilizers may be used to re-establish native grasslands on disturbed sites). As the nutrient levels increase, weedy species come to dominate, changing the composition of the eco-system. The changes in plant composition caused by increases in nitrogen levels have also been linked to increased leaching of nitrogen and a reduction in the sequestration of carbon in the soil and standing vegetation (Wedin and Tilman 1996). The change in plant composition also has an impact on the types of wildlife that are dependent on native plant life (McLaughlin and Mineau 1995; Wilson and Belcher 1989).

Many of these sites in agro-Manitoba are also critical to or are the only remaining habitats for some of the species listed under *The Endangered Species Act*, while other areas are of special concern due to their declining populations and distributions. Recently, attention has been drawn to significant declines in common North American bird species largely due to the loss or fragmentation of their habitats (Manitoba Conservation- Conservation Data Centre n.d.; Audubon n.d.).

There has been long-standing cooperation on the part of many producers to use or modify their farming methods (for example, by the adoption of rotational grazing) to conserve these resources while continuing to produce. In these systems, the cattle replace the role native bison played in the prairie landscape. Nutrients are recycled through the cattle and are taken up by the growing vegetation. Since no additional nutrients are added, the system remains in balance.

The addition of outside nutrients, either synthetic fertilizer or hog manure, will certainly increase the productivity of the vegetation, but it will also favour those species that can take up nutrients, particularly nitrogen, quickly and select against the less adaptable native flora. The impacts of this are two-pronged: the vegetation is more productive but the variety of plants and animals that occur is much reduced. Those that have long adapted to the soil, moisture and climatic conditions of the region are often eliminated. Changes in the nutrient balance will increase the nutrient runoff, leaching and losses to the environment.

This is of particular significance for the remaining tall grass and mixed grass prairie sites in Manitoba. For the most part, these grasslands have survived simply because they were rooted on lands that were not suitable for crop production: the mixed grass occurring on sandy soils in the southwest and the tall grass on stony soils in the southeast. The Tall Grass Prairie Preserve in the RM of Stuartburn is home to many listed (threatened or endangered) species in Manitoba and Canada. This ecological community is the last vestige (genetic source) of natural tall-grass grasslands that occurred in the Red River Valley in Manitoba and is only one of two areas in Canada where it can be found.

Increases in nitrogen levels in nearby pastures and fields could move on to these lands and affect the plant life composition. For example, the recovery plan for the Western Prairie Fringed Orchid, which only occurs in the Tall Grass Prairie Preserve, specifically identifies the application of hog manure to pastures in the area as a possible threat to this species and the ecosystem in which occurs (Environment Canada, 2006). With the application of hog manure on or near these sites, nitrogen may leach or flow overland and enrich the soil. This can cause a shift in the species composition and loss of the genetic bank of the indigenous species, including plants and all animals that depend upon them.

In addition to changes on highly vulnerable sites, consideration for alteration or conversion of critical habitat for more common species should also be considered. For instance, conversion of forested or brush land that does not appear to hold any significant ecological value may become problematic if this site is a traditional deer or elk seasonal-use site and now provides feed in the form of a forage field.

To address the above concerns, provincial and municipal planning processes should take into account the impacts of activities on the landscape and on native biodiversity. Consultations should be undertaken with ecological management specialists to identify vulnerable sites and those that should be treated with particular care. Buffer zones, in which no manure fertilizer can be applied, should be established surrounding sites such as the Tall Grass Prairie Preserve. Manure management plans should distinguish native pastures/grasslands from tame pastures/grasslands and application of hog manure to native grasslands or pastures be discouraged. (Native pastures are made up of native grassland species, while tame pastures are pastures that have been planted by humans.) Special attention should be paid to proposed spread fields that contain natural vegetation, with assessment being given to the effects their conversion may have on the local ecology and downstream effects on water management.

Manitoba Conservation's Wildlife and Ecosystem Protection Branch can play an important role in identifying those ecologically significant areas that need to be protected from manure application through the establishment of buffer zones in which no application would be allowed.

### Recommendations

11.1 The Manitoba government include biodiversity conservation considerations into its decision-making process regarding the expansion in the livestock sector or significant changes in land use. Policies should identify and respect critical regional wildlife habitats, discourage the conversion of natural habitats to serve as manure spread fields, and discourage the fertilization of native grasslands and prairies.

11.2 The Manitoba government identify ecologically sensitive sites (such as tall and mixed grass prairie remnants) and establish no-manure-application buffer zones around them. These zones should be established in consultation with eco-system specialists and hydrologists on a site-by-site basis.

## 11.2 Health

### 11.2.1 Workplace safety and health in the hog industry

The people who face the most direct health risks from the hog-production industry are those who work at the production sites. Aside from the various safety risks that can come from working with livestock in confined quarters, are the health risks associated with the dusts and gases that the production process gives rise to. The dusts arise from the animal hair, dried feces, and feed; the gases from the decomposition of urine and feces, fossil fuel heaters, and animal respiration. Key elements in controlling these health risks are the ventilation, design, and maintenance of the building. The pathogens described in Chapter 9 can also represent a potential health risk to the hog-production workforce.

The authors of a textbook on agricultural medicine state that of workers in intensive livestock industries, hog-production workers have the most frequent and severe health problems. According to the authors "Prevalence of respiratory symptoms...in nonconfinement swine workers is generally less than half of that reported by swine confinement workers" (Donham and Thelin 2006, 98). In addition, to these issues, hog-production workers are at greater risk than members of the general public of being infected by a zoonotic disease (a disease that moves from animals to humans).

The three best recommended methods of reducing risk involve:

- Control of dust and gas through management and engineering.
- Removal of contaminants in the air by way of the ventilation system.
- Use of personal protective equipment such as masks.

While the first two methods are by far the most preferable, it should be noted that Donham and Thelin concluded: "Anyone working in a swine or poultry [barns] should be advised, at a minimum, to wear a [National Institute of Occupational Safety and Health]-approved two-strapped dust mask, even if the concentrations of dusts and gases are below recommended limits. Persons exposed to [barns] with high dust or gas concentrations, or persons with respiratory conditions, may need to use a more sophisticated respirator such as a half-mask cartridge respirator or powered air-supplying respirator (Donham and Thelin 2006, 98)." The 2000 *Finding Common Ground* report reached similar conclusions, recommending "All barn workers should be strongly encouraged to wear proper masks" (Livestock Stewardship Panel 2000, 38).

When the Commission inquired about the implementation of the policy, it was told that Manitoba workplace safety and health regulations require employers to assess the risk to worker safety and health presented by chemical or biological substances in the workplace. Where the employer cannot reduce the concentrations of hazardous substances to legislated limits through engineering controls such as ventilation, the employer must provide workers with appropriate respiratory protection. Manitoba Labour and Immigration and Manitoba Agriculture, Food and Rural Initiatives have also collaborated with the Manitoba Pork Council in the development of educational material, including specific recommendations for protection from dust and gases, and special precautions when working in manure pits.

The *Finding Common Ground* report also recommended that "Government, in conjunction with the industry, should review the in-barn environment with a view to: establishing a monitoring regime and ensuring compliance with existing regulations, especially those affecting the safety and health of workers, assessing the training needs of barn workers, and identifying research priorities which bear upon the health of operators, workers and the nearby public" (Livestock Stewardship Panel 2000, 38). In response to inquiries about this recommendation, the Commission was informed that, in 2002-2003, Manitoba Labour's Prevention Services Branch of the Workplace Safety and Health Division, made the hog-production industry one of its focus industries, inspecting 35 operations in that year. The issues identified varied, depending on the size and age of the operation. In some cases, operations were instructed to carry out air-quality monitoring. The province does not require companies to report the findings of their air-quality monitoring, but records must be kept and be available upon request of a safety and health officer. While the Manitoba government has legislation requiring the establishment of workplace safety and health committees, Manitoba hog-production operations have too few employees to meet the threshold at which these committees are mandatory.

Agricultural workers are not currently covered by *The Workers Compensation Act*, although some producers may choose to take out voluntary coverage. In 2005, a public review of *The Workers Compensation Act* commissioned by the Manitoba government recommended that "WCB coverage of workplaces should be extended gradually over a three- to five-year period beginning with the inclusion of higher-risk workplaces that are not already covered" (Legislative Review Committee on *The Workers Compensation Act* 2005, 17). The Manitoba government subsequently indicated that it would be extending coverage following stakeholder consultations. The Commission encourages the government to meet the timetable set out by its Review Committee. Such a move would be an important first step in collecting local data on illnesses related to the hog-production industry in Manitoba.

The most important decisions regarding in-barn safety and health are those that are made before the barn is constructed. It is at that point that the key decisions regarding ventilation and engineering are made. Once the barn is constructed, ventilation problems become much more difficult to resolve and greater reliance is placed on personal protective devices such as masks. Barn-design decisions regarding ventilation can also have a significant impact on odour-related issues. Currently in Manitoba, farm buildings are exempted from the provisions of the National Farm Building Code. This exemption has implications for animal safety as well as for worker safety. According to the Manitoba Fire Commissioner's Office, from 1996 to 2004, farm building fires in Manitoba were responsible for an average of $8.6-million a year in damages.

### Comment

Workers serve as sentinels for many health issues that could move into the general community. Furthermore, they are exposed to potential hazards at far greater concentrations than other members of society. For these reasons, the Commission believes that monitoring and protection of worker health will help to ensure the environmental sustainability of the hog-production industry. The limited number of people involved in inspecting hog-production facilities and the limited number of inspections that are made suggest that there is a need for further resources in this area. Similarly, the Commission wishes to stress that hog-production workers need to be informed of the potential health risks that they face and the importance of having the appropriate protective equipment. Finally, the Commission encourages the Fire Commissioner's Office to work with Manitoba Agriculture, Food, and Rural Initiatives (MAFRI) to develop a proposal that could lead to the partial adoption of the National Farm Building Code for all new buildings over a specified size. The code would provide minimum requirements for human health, fire safety and structural sufficiency.

### Recommendations

11.3 The Manitoba government increase the resources of the Workplace Safety and Health Prevention Service Branch to provide for more inspection of hog-production operations.

11.4 The Manitoba government take steps to have a modified version of the National Farm Building Code apply in Manitoba following consultation with concerned parties.

### 11.2.2 Animal diseases

Manitoba hog producers have instituted a number of different procedures to protect animal health. These include, but are not limited to, the three-site production system, biosecurity measures at each site, and the use of various feed additives to improve health and prevent disease. These measures are intended not only to protect individual animals, but to prevent the spread of infectious animal diseases.

In the last decade, outbreaks of highly contagious animal diseases in Taiwan, the United Kingdom, and the Netherlands have led to a restructuring of industries and widespread public debate over the future of the industries (The Royal Society 2004). An outbreak of a foreign animal disease, such as foot-and-mouth disease or classic swine fever, would represent a significant threat to the Manitoba hog-production industry. Such an outbreak could cause border closings, a particularly disastrous event given the provincial hog industry's dependence on export markets for live hogs.

In Canada, the first step in any response to a disease outbreak would be to attempt to stamp out the disease by killing the infected animals: this would be accompanied by measures intended to trace, vaccinate, and quarantine or slaughter animals that had been in contact with infected animals. In Canada, the federal Canadian Food Inspection Agency (CFIA) has responsibility for overseeing these measures, including the authority to order the destruction of infected animals and paying compensation for infected animals or animals that had come into contact with infected animals.

Such a disease outbreak would likely lead to a closing of the U.S. border to Canadian hogs. This would create a financial problem for hog producers who would no longer have market access. It would further create an on-farm crisis, as the numbers of hogs would rapidly surpass the holding capacity of hog barns. Within 96 hours of the closing of the U.S. border (either because of disease in Canada or a U.S. state), the population of isoweans in Manitoba would reach a crisis point. The response in other jurisdictions has been to kill these healthy animals in what is termed welfare slaughter. Research provided to the Commission stated that responsibility for the carrying out of such a slaughter has not been included in any current North American disease emergency plans. The cost of welfare slaughter can dramatically outstrip the cost of stamping out the disease. Intensive animal-production industries that are geared towards export markets have among the highest welfare slaughter costs. For example, the cost of the welfare slaughter in response to the 1997-1998 outbreak of classic swine fever in the Netherlands was $852-million U.S., while the cost of stamping out infected herds was $104-million U.S. It is estimated the direct cost of stamping out a small foot-and-mouth outbreak in Canada (one that affected 10,000 animals) would amount to only one per cent of the total financial impact of the outbreak once the costs of the welfare slaughter and related losses are accounted for.

In other jurisdictions, controversies have arisen in relation to the lack of veterinarians, the lack of skilled personnel to slaughter animals (ideally infected animals should be slaughtered within 24 hours of identification and animals in herds that have made contact with infected animals within 48 hours), method of slaughter, and carcass disposal.

While the CFIA has responsibility for the suppression of the disease on infected farms, Canada lacks both the framework and the funding to deal with the animal welfare issues arising from an infectious foreign animal disease outbreak. Without effective welfare measures in place, it may not be possible to eliminate the disease: a result that could lead to the collapse of the industry. (The level of existing commercial slaughter capacity can make it possible for a region to be declared disease-free in a relatively short period. As a result, Quebec, which slaughters most of the hogs raised in the province, would experience a shorter period of border closing than Manitoba.)

There would be no mandatory federal government response to the severe animal welfare problem created by a border closure due to disease in the U.S. In this situation, the provincial government may find itself having to take responsibility for organizing the response. The welfare slaughter and associated costs that accompanied swine fever and foot-and-mouth disease outbreaks in other jurisdictions have led to reduced public support for those industries. In the Netherlands, the government adopted a policy intended to reduce the size of the industry and strictly license its operation.

In 2006, the Manitoba government amended *The Animal Diseases Act* to allow the Chief Veterinary Officer to authorize welfare slaughter of livestock in emergency situations (Whiting 2003; Whiting 2006; Whiting n.d.). The Manitoba Pork Council has established an emergency planning committee in preparation for a potential foreign animal disease outbreak or food safety issue.

The Commission also notes a number of Technical Review Committee (TRC) Reports recommended that proponents should consider preparing a contingency plan in case of a catastrophic event resulting in mass mortalities. While the TRCs have recommended that such plans be established, there is currently no requirement for such plans. It is the Commission's opinion that such contingency plans should be a part of the permitting process.

The issues brought about by an animal disease outbreak coupled with a border closing could have serious consequences for the social and economic sustainability of the hog-production industry. The Commission believes the Manitoba government must play a leadership role in developing a contingency plan to address the potential consequences of such an outbreak. At the same time, the provincial government must work with the federal government and other provincial governments to develop a national agri-food disaster response. The Commission also notes that while the greatest problems would arise from a disease outbreak, many of the problems associated with such an outbreak could also flow from a politically motivated border closing.

### Recommendations

11.5 The Manitoba government take the lead in developing a contingency plan to address the animal welfare consequences of a border closing. The planning should account for both border closings caused by a large-scale animal disease outbreak and those that arise for reasons such as erection of trade barriers.

11.6 The Manitoba government work with producers to develop individual contingency plans to respond to a catastrophic event resulting in mass mortalities.

### 11.2.3 Antibiotic use in hog production

Antibiotics are administered to feed animals for three purposes: 1) to treat disease, 2) to serve as a prophylactic at times of high risk, for example after weaning or during transport, and 3) to promote growth or performance. It is not uncommon for drugs to be classified for several categories at once.

As noted in Chapter 6, there is a concern that the use of antibiotic drugs leads to the development of bacteria that are resistant to those antibiotics. This concern has led to measures to reduce the prescription of antibiotics in the treatment of humans. It has also led to calls for limitations on the use of antibiotics for disease prevention and growth promotant in animal husbandry (Khachatourians 1998; Levy 1998; McGeer 1998; Shea 2004). It should be noted that there is no evidence to suggest that antibiotic use in the treatment of animals is the primary cause of the development of human antibiotic resistant bacteria. In recent years, a number of studies have indicated that hog-industry workers have an elevated risk of development of the so-called superbug, methicillin-resistant Staphyloccus aureus (MRSA) (Voss et al. 2005 and Khanna et al. 2007). This has led Dutch medical authorities to screen hog-production workers who are admitted to hospital, for any reason, to determine if they are carrying MSRA (Moyer 2006).

There is a potential pathway to connect the antibiotics used in agriculture and human beings. A study prepared for the Commission concluded that manure and wastewater spread on Manitoba fields are likely to contain microorganisms that are resistant to antibiotics or antibiotics that can move into the environment. The antibiotics and bacteria can reach people via food or wastewater. While Health Canada has mandated that, in general, the same antibiotics should not be prescribed to both humans and animals, some overlapping use exists (Holley et al. 2007).

The governance of the use of antibiotics in agriculture is split: Health Canada evaluates the drugs and regulates their sale and labelling, while the provinces regulate the practice of veterinary medicine. In Ontario, dealers must be licensed and, in Quebec, the sale of veterinary drugs is restricted to pharmacists and veterinary surgeons. In Manitoba, there is no licensing requirement for selling these drugs.

Federal regulation divides animal drugs into those that can be sold over-the-counter and those that need a prescription. In Canada, feed grain companies play a central role in the sale of antibiotics, since they can add drugs to feed as long as they are on the federal government's Compendium of Medicating Ingredient Brochures (CMIB). There is no requirement for a veterinarian's prescription for the sale of these drugs. The Canadian Food Inspection Agency (CFIA) monitors the use of feed-additive medications primarily through facility inspection, label inspection and feed sampling and testing programs at feed mills and farms in Canada.

A 2000 CFIA regulatory impact analysis statement reported "Feed-additive drugs are commonly administered to livestock in Canada to prevent or treat disease conditions or accelerate animal growth as part of conventional livestock production programs. Administering medications via feeds is considered a practical and cost-effective way to treat groups of animals being raised for breeding or food production purposes under a variety of management systems." The report estimated that about 30 percent of feed used in Canada, whether manufactured for commercial sale or made by producers for feeding to their own livestock, contained medications (Government of Canada 2000).

In its submission to this Investigation, the Manitoba Pork Council pointed to the Canadian Quality Assurance (CQA) program that the industry has developed and maintained as an on-farm food safety program for Canadian hog producers. It is based on the principles of the Hazard Prevention Critical Control Point model. Producers who wish to participate in the CQA have to be validated to determine if they are meeting the program requirements. Under the CQA program, producers are required to record the drug name, the manufacturer, whether or not it is being used under prescription, why it is being used, the dosage, the route of administration, contraindication, cautions, and warnings, where it is stored, and the withdrawal time.

The form is to be signed by a veterinarian and the producer.

For the Commission, the key concern with this issue is the lack of data. While it does not appear that the antibiotic issue is currently a threat to the environmental sustainability of the industry, the provincial government lacks the data it requires to manage or ensure its long-term sustainability in this area. Simply put: there is no record of which drugs are being used or of the quantities of drugs being used. Currently, it is not possible to compare the amounts and classes of antibiotics used in the swine industry versus those prescribed to humans (Holley et al. 2007).

*The Animal Diseases Act* gives the Manitoba government the right to regulate the sale of drugs for animals. The government has not enacted any such regulation. Elements of such a regulation might include:

- Licensing of all vendors.
- Requiring all vendors to have a place of business and proper storage facilities.
- Prohibition on sales promotions.
- Prohibition on selling expired drugs.
- Recording of the name and address of the purchaser, along with the brand name and quantity of the livestock medicines sold.
- Prohibiting the repackaging of drugs.
- Requiring that each product must be sold in the original package as it was received from the manufacturer.
- A system for the return and disposal of expired and/or unwanted drugs.

Similarly, in Manitoba, there is little monitoring of pathogen-related illness in food animals, the level of antibiotic resistance in food animals, or of the presence of such resistant microbes in the environment, in general, and surface water, in particular. This is a situation that should be rectified.

### Recommendations

11.7 The Manitoba government enact regulations under *The Animal Diseases Act* to regulate the sale, use and disposal of drugs for animals. This regulation should include the recording of information on the drug types, volumes, length of treatment, classes of animals being treated, and purposes to which these medications are being used. This information should be compiled, analyzed, and reported to the public on a regular basis.

11.8 The Manitoba government work with the federal government, other provincial governments, and research institutes to establish a comprehensive data collection network on antibiotic resistance in food animals.

11.9 The Manitoba government monitor surface water for microbial contaminants, especially in regions with high concentrations of intensive livestock operations.

11.10 The Manitoba government have hog manure examined for the presence of antibiotics and antibiotic resistant bacteria.

11.11 The Manitoba government facilitate, encourage, and undertake further studies into the efficacy and requirement for the use of antibiotic drugs in feed animals.

# 12 The approval process and watershed planning

## 12.1 Watershed planning

The preceding three chapters have dealt with the potential impacts that livestock operations can have on the environment and presented the Commission's recommendations as to how these issues can be addressed in a way that will allow the industry to develop in an environmentally sustainable manner. The Commission recognizes that the move to a more sustainable form of production could constitute a considerable financial challenge to some operators. This is, in large measure, a result of the way the industry developed in the past, particularly in the way it has clustered in specific geographic regions where production has not been able to remain in balance with the landscape.

The Commission is of the opinion that the development of the hog-production industry can take place most effectively (and environmentally unsustainable clustering can be avoided) if decisions are made on a watershed basis. This is in keeping with *The Water Protection Act*, which states that the Manitoba government "is committed to watershed planning as an effective means to address risks to water resources and aquatic ecosystems and believes that residents of watersheds should be consulted when watershed plans are developed." The Act also identifies the importance of comprehensive planning for watersheds, with respect to water, land and ecosystems, on a basis that acknowledges and considers their interdependence.

Under the Act, the government may designate watersheds and their boundaries and designate a water-planning authority for a watershed (which may be a conservation district board, a planning district board, a municipal council, any other entity or a combination of some or all of the above). The government can also set a date for establishing a plan and provide the terms of reference for a plan. Among other considerations, watershed plans under the Act must take into account "the capacity of the environment to accommodate development, and any other matter related to present or future physical, social or economic factors." The Commission recognizes that the development of watershed-based planning and decision-making is a complex process. For example, no municipal boundaries coincide with watershed boundaries. While Conservation District boundaries are more closely aligned with watershed boundaries, they currently lack the authority and the legitimacy to take on many of the land-use planning responsibilities held by municipalities. Despite this, many municipalities and local planning authorities are already taking watershed issues into consideration when they make their planning decisions, particularly when there is a local Conservation District in place. The Swan Valley Planning District, for example, generally fits with a watershed boundary and the Commission encourages new and existing districts to consolidate, where possible, along watershed boundaries.

The paper prepared for the Commission by the International Institute for Sustainable Development entitled *Toward Watershed-Based Decision-Making and Total Nutrient Loading Reduction* (Oborne et al. 2007) outlines one path that the Manitoba government could consider for the implementation of its water strategy.

## 12.2 The current approval process

While the Commission believes that the long-term approach to addressing siting decisions related to livestock development should be made on a watershed basis, it believes that there is a need to address the current approvals process in the short term.

Like the Commission, the Livestock Stewardship Panel of 2000 wrestled with the issue of the approval process for livestock operations. In its report, *Finding Common Ground*, it concluded that a "two-approval" process was appropriate for Manitoba. Under this approach, municipalities would make land-use decisions, while the provincial government would make environmental decisions. The Livestock Stewardship Panel concluded that the existing system, by which the municipality took responsibility for land-use decisions, while the province issued manure storage and water rights licenses needed to be replaced by a new process. It recommended that:

> New and expanding ILOs should require formal approval by both the host municipality for compliance with its land use by-laws, and the province for environmental impact before construction is allowed to begin. (Livestock Stewardship Panel 2000, 25)

While the provincial government made Technical Review Committee reports mandatory for operations over 300 animal units, and gave the Technical Review Committees additional authority, it did not introduce the environmental approval system that *Finding Common Ground* had envisioned. The Commission endorses the Livestock Stewardship Panel's two-approval approach. In assessing the current approval process, the Commission was also guided by those guidelines in *The Sustainable Development Act* that call for public participation, access to information, and integrated decision-making.

The current approvals process, for operations of 300 or more animal units, involves three key elements:

- The report prepared by the provincial Technical Review Committee.
- The rural municipality's decision as to whether or not to grant a conditional-use permit.
- Manitoba Conservation's decision as to whether or not the proposed manure-storage facility meets with permitting criteria.

The Commission has the following comments on these three elements.

### 12.2.1 Technical Review Committees

The regional Technical Review Committees, which are chaired and coordinated by Manitoba Agriculture Food and Rural Initiatives (MAFRI) have seen their roles and responsibilities grow considerably since they were first established in the mid 1990s. A major contribution of the TRC is that it provides a public report at an early stage in the approval process. Unfortunately, these reports are, at times, based largely on a fairly limited information base. According to a terms-of-reference document for the TRC process that was provided to the Commission, the TRC requires the following information:

- A completed livestock production information sheet.
- Application for Local Planning Approvals, where required.
- Soil test results indicating nitrogen and phosphate levels in the fields on which it proposed to apply manure.

The TRCs also make use of published information on such issues as soils, geology, hydrogeology, water well logs, land-use and zoning policies and bylaws, *The Farm Practices Guidelines*, the Livestock Manure and Mortalities Management Regulation (LMMMR), and other provincial regulations.

In assessing cumulative impacts, the TRC is to describe "the potential effect of a proposed livestock operation on a specified surrounding area, in terms of the assimilative capacity of the land base of the proposed facility, and neighbouring livestock operations (within a two-kilometer radius), to utilize livestock manure on a sustainable basis as a crop nutrient." As part of the cumulative assessment, the TRC would also review soil test information to determine a baseline of soil fertility levels of the proposed spread fields (Manitoba Government 2000b).

TRC members are not always able to conduct on-site visits prior to the completion of the report (this can be for a variety of reasons, including the season and staff familiarity with the site). For these and other reasons, there have been situations in which the TRC report has contained erroneous information. The TRC reports, in effect, acknowledge their limitations by assuring readers that:

> There will be another review and approval at the provincial level on the environmental aspects of the proposal, which will require more on-site engineering and soil information regarding the storage and application of the manure produced by the operation.

*The Planning Act* states that a municipality cannot approve a project unless a TRC has concluded that "based on the available information, that the proposed operation will not create a risk to health, safety or the environment, or that any risk can be minimized through the use of appropriate practices, measures and safeguards." None of the TRC reports reviewed by the Commission made specific use of this language. In one case, where sufficient acres for manure application were not available, the opinion that the project should not be approved was attributed to the Department of Conservation, as opposed to the TRC as a whole. It was left to the municipal council to determine if the TRC had or had not concluded that the project would "not create a risk to health, safety or the environment."

As a result of the fragmented nature of the TRC reports, the current process does not appear capable of providing clear direction in controversial cases. The Commission wishes to make it clear that it does not attribute the shortcomings it has identified to any of the individuals involved with the TRC process. What started as an advisory committee has slowly been asked to take on a range of different and, at times, conflicting roles. The confusion was apparent even in the 2006 Manitoba Conservation publication on the environmental sustainability of the hog-production industry. In the text, it was stated that the TRC is not a decision-making body, while in the accompanying diagram, readers were informed that proposals must be rejected by council if TRC recommends 'No'" (Manitoba Government 2006, 18-19), which suggests that TRC recommendations have, in effect, the power to stop proposals.

### 12.2.2 The conditional-use process

The municipal process called for in *The Planning Act*, with its mandatory livestock operation policies (LOP, described in Chapter 7), mandatory public notices, posting of properties, advance publication of the TRC report (recognizing the limitations of these reports), public debate, and a public decision, reflects the spirit of *The Sustainable Development Act* Guidelines for public participation, access to information, and decision-making and planning. Recent changes to *The Planning Act* have introduced a great deal more predictability into the process. In particular, municipal authorities are required to have LOPs in place as part of their development plans by 2008. These LOPS are to be developed through a process of public consultation, taking into consideration such matters as soils, the size of the livestock operation, proximity to significant surface water bodies, flood risk, groundwater vulnerability, and proximity to residential and recreational development. The Commission believes that local control is an important aspect of land-use planning. For this reason, it favours a continuation of the policy of requiring conditional-use approvals for all ILOs. It also believes that this planning must take place in the context of a publicly developed and accepted livestock operation policy. The Commission does not recommend the introduction of an appeal process for municipal council decisions.

### 12.2.3 The provincial permitting process

As noted earlier, the TRC report states that the proposal for a new or expanding livestock operation will undergo "another review and approval at the provincial level on the environmental aspects of the proposal." This refers to the permitting process for a manure-storage facility required by the LMMMR. As outlined in Chapters 7 and 9, there is a significant assessment process at this point. That assessment, however, is limited solely to the integrity of the proposed manure-storage facility and the proponents' access to sufficient land to apply manure at up to twice the phosphorus crop removal rate. Issues such as biodiversity, emissions to the atmosphere, and impact on the larger watershed are not assessed in this process. Nor does this process result in the issuance of a public report.

## 12.3 A new approval process

The Commission is proposing the same dual approval process as recommended by the Livestock Stewardship Panel. The rural municipality would be responsible for land-use decisions, while Manitoba Conservation would be responsible for issuing permits for manure-storage facilities to all new, modified, and expanding livestock operations. The Commission recognizes that livestock operations and their manure storage facilities are relatively straightforward and predictable in nature. While it is not recommending that such projects be subject to a full environmental licensing process, it is proposing stricter requirements and broadening the range of items requiring assessment. Chapter 11 of this report, for example, contains recommendations calling for the inclusion of biodiversity conservation considerations into the provincial decision-making process regarding the expansion in the livestock sector or significant changes in land use.

It is essential that the public be provided with the information on which the land-use and environmental decisions are to be made, that the public be allowed to have a meaningful input into those decisions, and that the decision making process be clear and transparent. For these reasons, the Commission is proposing that the current TRC process, be replaced with a site-assessment and review process that would be coordinated by Manitoba Conservation. Advice should be sought from other departments as appropriate, but their role should be strictly advisory. The proposed process is described below and outlined in Figure 12.1.

### 12.3.1 Site assessment

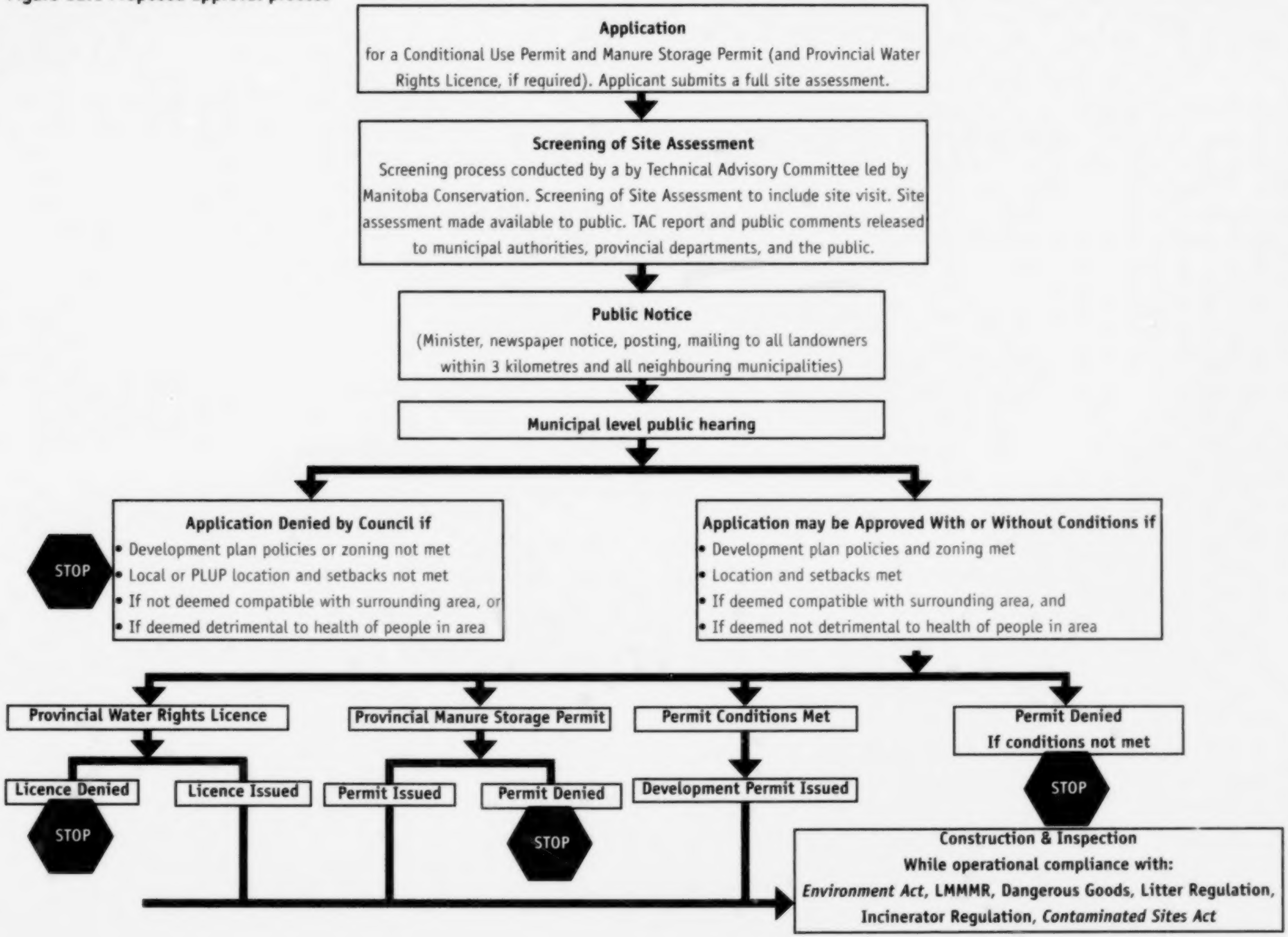
The Commission is recommending that the Manitoba government require that proponents of the construction, modification, or expansion of a manure-storage facility be required to submit a site assessment at the start of the application process. This site assessment would be prepared by the proponent and would address issues identified by both the municipality and the provincial government. It would be more extensive than the information contained in the TRC reports. It would include, but not be limited to the following issues:

- Land ownership.
- A description of the existing land use and adjoining land use.
- Proposed changes to land use, immediate and future.
- Land-use designation for the site.
- A description of the proposed development.
- Manure-storage facility siting information (distances from watercourses, water sources, surface water recharge areas, property boundaries, residences, and designated areas (urban centres or settlement centres; rural residential or seasonal residential areas; and parks or recreational areas, significant wildlife habitats)). This would also include depth to groundwater table, flood return period, and the presence of abandoned wells.
- Detailed information on the form of manure-storage facility being proposed.
- Detailed manure application information including whether there is a requirement to convert native habitat to cropland to accommodate manure application.
- A demonstration that the operator has access to sufficient cropped land base to balance phosphorus application rates with removal rates over the long-term.
- Detailed site and design plans.
- Soil characteristics of the site the facility is to be built on.
- Soil characteristics of the spread fields.
- An identification of which subwatershed and watershed the operation will be located in.

### 12.3.2 Reviewing the site assessment

The review process should be lead by Manitoba Conservation, the permitting authority, with the assistance of a central provincial government technical advisory committee (TAC) that would screen the site assessment to determine if further information is required from the proponent. The TAC would consist of representatives

**Figure 12.1 Proposed approval process**



**Application**
for a Conditional Use Permit and Manure Storage Permit (and Provincial Water Rights Licence, if required). Applicant submits a full site assessment.

**Screening of Site Assessment**
Screening process conducted by a by Technical Advisory Committee led by Manitoba Conservation. Screening of Site Assessment to include site visit. Site assessment made available to public. TAC report and public comments released to municipal authorities, provincial departments, and the public.

**Public Notice**
(Minister, newspaper notice, posting, mailing to all landowners within 3 kilometres and all neighbouring municipalities)

**Municipal level public hearing**

**Application Denied by Council if**
- Development plan policies or zoning not met
- Local or PLUP location and setbacks not met
- If not deemed compatible with surrounding area, or
- If deemed detrimental to health of people in area

**Application may be Approved With or Without Conditions if**
- Development plan policies and zoning met
- Location and setbacks met
- If deemed compatible with surrounding area, and
- If deemed not detrimental to health of people in area

**Construction & Inspection**
**While operational compliance with:**
***Environment Act*, LMMMR, Dangerous Goods, Litter Regulation, Incinerator Regulation, *Contaminated Sites Act***

STOP
Provincial Water Rights Licence
Licence Denied
STOP
Licence Issued
Provincial Manure Storage Permit
Permit Issued
Permit Denied
STOP
Permit Conditions Met
Development Permit Issued
Permit Denied
If conditions not met
STOP

from a core of provincial government departments and be augmented with others as each situation called for. Suggested core membership would include members from Conservation (Livestock Program and Wildlife and Terrestrial Ecosystem Management), Water Stewardship (Surface Water, Water Quality, Groundwater, Licensing, and Fisheries), Intergovernmental Affairs, Agriculture Food and Rural Initiatives (Agri-Environment), and Infrastructure and Transportation. Other departments that might be consulted could include Health and Labour, depending on the issues under consideration. A Manitoba Conservation representative would chair and coordinate the work of the TAC. Consultations should be undertaken with local soil and water associations, such as a Conservation District.

### 12.3.3 Public input into the site assessment

The site assessment would be placed on the appropriate public registry and made available to the appropriate municipal offices. The public would be invited to submit comments to Conservation on the proposal. At the end of the screening process, which would include a mandatory site inspection by a Manitoba Conservation representative, Conservation would issue a public report on the project, similar to those currently produced for environmental licenses, identifying the relevant land-use and environmental impact issues. This report, the site assessment, and the TAC comments, would go to the municipality, the local offices of relevant provincial departments, and the public registry. Public comments submitted during this process would be part of the report.

### 12.3.4 The process following the completion of a site assessment

When the site assessment has been screened by the TAC and accepted by Manitoba Conservation, the proposal would proceed to the municipal authority for its review and approval of a conditional permit. Should environmental issues that were not addressed be raised at the conditional-use hearing, they should be referred back to Conservation. Should the municipality approve the proposal, the proponent would then apply to Conservation for a permit under the LMMMR and to Water Stewardship for a water rights licence (if required). Manitoba Conservation should be able to assess whether the proponent meets the requirements for the issuance of a permit based on the information that had been supplied in the initial site assessment.

In short, the Commission believes that the process it is proposing would allow for an early and public identification of all relevant issues and provide the public with an opportunity to make informed written submissions to Manitoba Conservation and make an informed contribution to the municipal conditional-use process. Decision-makers would have more information on a wider range of issues available to them at an early stage in the process. While proponents would be required to produce more information in the early stages of the process, the more comprehensive examination and review of the proposal by the TAC should provide greater predictability to the process.

### Recommendation

12.1 The Manitoba government adopt a new approval process for new, modified, and expanding manure storage-facilities operations as detailed in Chapter 12. Under this process, proponents would submit detailed site assessments that would be screened by a provincial Technical Advisory Committee coordinated by Manitoba Conservation. The review process would produce a report that would be available to the public, along with the site assessment. This report, the site assessment, and the TAC comments, would go to the municipality and the local offices of relevant provincial departments.

Responsibility for determining land-use issues would remain with the municipal authority, while the provincial government would retain responsibility for the issuance of environmental approvals.

# 13 Information and research

Throughout this Report, the Commission has identified information gaps and called for additional research. The Commission recognizes that government also has a role to play in ensuring that information is available to decision makers and the public in a timely and ongoing manner. The Third Guideline for Sustainable Development in *The Sustainable Development Act* highlights the value of "Access to Information—which means (a) encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and (b) promoting the opportunity for equal and timely access to information by all Manitobans." While there can be good reasons for the government to withhold certain data that it collects, particularly when it affects the privacy or proprietary concerns of other Manitobans, the Commission favours an approach that makes information of public interest available on a regular basis. This chapter surveys the key information and research issues and makes two overarching recommendations.

## 13.1 Information

In its 2000 report, the Livestock Stewardship panel commented that it was "surprised at the lack of assembled information on the distribution of the livestock industry around the province."

It called for the establishment of an information system that would "provide Manitobans with a means for more accurately tracking the environmental effects of present and future livestock operations (as well as other industrial operations that might impact on water quality)" (Livestock Stewardship Panel 2000, 49). Seven years later, the Commission finds that both comments retain considerable validity. There is a great deal of information about the hog-production industry that is not known. Second, there is a great deal of information that is known that is not readily available to the public.

There are varying reports of the number of hog production operations on the landscape. Some of this variation is understandable: the Manitoba Pork Council reports on producers who meet specific marketing requirements, while the basis of Manitoba Conservation's understanding of the size of the industry springs from operators that have been required to either file manure management plans or seek permits for manure-storage facilities. While there have, in the past, been recommendations to have all livestock operations with over 300 animal units register with the province, this recommendation has never been implemented. Perhaps the most problematic result of this approach is the fact the provincial government does not have a clear handle on the number of operations that have manure-storage facilities that were constructed prior to 1994, the year in which the province began permitting such facilities.

A brief list of areas where, in the previous chapters, the Commission has recommended improvements in data collection and compilation includes:

- Water quality information, which is incomplete for large rivers and non-existent for small streams.
- Identification of ecologically sensitive sites.
- Water supply and water use data for the livestock sector.
- The use of antibiotics and the presence of antibiotics in the environment.
- Pathogens in manure, soil, groundwater and surface water.
- Illnesses related to hog operations.
- Heavy metals in agricultural soils in relation to the application of manure fertilizer.

There also needs to be improvements in reporting on the number, type, and location of livestock operations. The Auditor General reported a reluctance on the part of Manitoba Agriculture, Food and Rural Initiative staff to share information regarding the location of non-permitted manure-storage facilities with Manitoba Conservation staff. Environmental sustainability requires that MAFRI and Manitoba Conservation, and other departments work cooperatively to collect, report, and share data.

There is also a need for the public release of information on a regular basis. Manitoba Conservation and Manitoba Water Stewardship are collecting data on a wide range of issues. Reports should be provided on such matters as:

- Nutrient concentrations and loading of tributaries, particularly those in areas of intensive livestock operations.
- Nutrient analysis assessed annually to identify trends and measure potential impact to surface water.
- Soil test data and trends based on manure-management soil tests.
- Water quality trends based on the monitoring-well and source-water analysis.
- Ambient and indoor (barn) air-quality data in the vicinity of intensive livestock operations.

- Enforcement and inspection.

**Recommendations**

13.1 Manitoba Conservation and Manitoba Agriculture, Food and Rural Initiatives develop a common database to record the presence of all Manitoba livestock operations.

13.2 The Manitoba government develop and publish a series of trend reports on the data that it collects and compiles on water quality, soil quality, air quality, and health issues related to the raising of livestock.

## 13.2 Research

The Commission is recommending that the Manitoba government conduct, facilitate, collaborate on and commission research in a number of areas. The Commission is not identifying which projects should be undertaken by government alone and which research partners should be engaged for other projects.

Since the expansion of the industry in the late 1990s, Manitoba researchers have been engaged in a wide variety of projects related to the hog-production industry. The industry itself, through the Manitoba Pork Council (MPC), has played a critical role in funding this work. The MPC and the Manitoba government were instrumental in establishing the Manitoba Livestock Manure Management Initiative (MLMMI). The MLMMI coordinates research on manure management and has invested in excess of $3.5-million in nearly 50 projects, with nearly half of that amount coming from the MPC.

The University of Manitoba has established a National Centre for Livestock and the Environment at its Glenlea Research Station. The 486-hectare research and teaching facility's long-term goal will be to develop environmentally sustainable livestock production practices. Issues that it will be addressing are animal housing, manure handling, cropping systems, soil, air and water health, animal welfare, and food safety. MPC contributed $750,000 to the Centre.

The University of Manitoba, Manitoba Agriculture, Food, and Rural Initiatives (MAFRI), and MPC also collaborated in the establishment of the Swine Research and Development Centre Consortium in Brandon, which provides a series of research and evaluation services to the hog production industry.

Another source of support for research is the Agri-Food Research and Development Initiative (ARDI), which is funded by MAFRI and Agriculture and Agri-Food Canada. It supports research intended to assist producers and consumers and the development of technologies, production methods, and markets. Administered by the Manitoba Association of Agricultural Societies, it has supported a variety of research related to hog-production and the environment.

The Deerwood Soil and Water Management Association, established in 1984, is made up of approximately 120 farmers within an 875 square kilometre area (342 square miles) along the Manitoba Escarpment in South-central Manitoba. The Association has conducted research into such practices as zero and minimum tillage, rotational grazing, shelterbelts, and small dam construction. In 2004 it was contracted to undertake an extensive investigation into the effectiveness of a series of best management practices. It is one of seven such projects across the country one of only two in the Prairies. It has also been involved in studies into the impact of replacing synthetic fertilizers with manure.

The Commission supports the extensive role that the industry has played in supporting research and the way the academic community has become involved in research that is directed towards addressing pressing local issues. The Commission urges the government to take the necessary steps to ensure the integrity of the research. As issues become increasingly complex and controversial, it will be necessary to require more peer review of research. It will also be necessary to broaden the range of issues that are under examination. In the process, a broader range of disciplines are likely to be called upon to engage in research related to the sustainability of this sector.

It is preferable to move towards a watershed-planning model for making decisions on the location of developments such as hog-production facilities. Moving to such a model will require changes in political structure, which may take a considerable period of time. Furthermore, we do not currently have the full range of information (both in terms of scientific understanding of the movement of nutrients through watersheds and the background levels of nutrients in the environment) to allow for truly effective watershed planning.

The province has a well developed set of academic resources: the universities have considerable research and analytical capability when it comes to water quality and water engineering related issues, and the colleges have a great deal of applied engineering knowledge in hydrology and water quality. In both cases, students are often engaged in research that relates to Manitoba water. The opportunity exists to bring these resources together in a multi-disciplinary inter-institutional Watershed Studies Institute. Aside from carrying out research into watershed issues common to all Manitobans, the Institute could serve as a resource to the provincial government, municipalities, and conservation districts as they address watershed-planning issues.

Advantages of such an institute would stem from focusing and partnering the research expertise resident in the province on watershed issues of concern, while providing a means to house and share watershed knowledge and data. An institute would have greater leverage to seek funding while fostering a climate of partnership between universities, colleges and government agencies.

**Recommendation**

13.3 A Watershed Studies Institute be established to coordinate information collection, analysis, and evaluation, direct research and provide support to agencies and organizations undertaking watershed management in Manitoba.

## 13.3 Communication and information coordination

As noted earlier, the hog-production sector is governed by a number of legislative acts, which are administered by a several different provincial departments and agencies. Staff from Manitoba Conservation, Manitoba Water Stewardship, Manitoba Intergovernmental Affairs, and Manitoba Agriculture, Food, and Rural Initiatives, Manitoba Labour, and the Manitoba Farm Practices Protection Board may at some point become involved in making decisions that affect the future of an individual hog producer. These decisions can be based on *The Environment Act*, *The Water Rights Act*, *The Farm Practices Protection Act*, *The Planning Act*, *The Workplace Safety and Health Act*, and the Livestock Manure Management and Mortalities Regulation, to cite only a few of the applicable pieces of legislation. Furthermore, municipal authorities play a key role in the permitting process, particularly when it comes to putting in place odour-control measures.

It was apparent from the public meetings and research prepared for the Commission, that many members of the public, including producers, find this array of agencies confusing. The merger of the departments of Natural Resources and Environment to create Manitoba Conservation, the creation of Manitoba Water Stewardship, and the introduction of the Nutrient Management Regulation have all further complicated matters. Legitimate confusion exists as to the responsibilities of various departments.

The Commission recognizes that, in a complex world, numerous pieces of legislation will apply to an activity such as hog production, which has social, economic, and environmental implications. It also recognizes that it is appropriate for different departments to have different responsibilities in addressing environmental issues.

The Commission believes the Manitoba government should implement measures that would assist members of the public in general, and producers in particular, in navigating this increasingly complex system. This could include an interdepartmental communication strategy that would see the development of plain language documents explaining the pertinent pieces of legislation and the roles of the various government departments—and the branches and agencies affiliated with those departments. Such a communication strategy would also ensure that calls made to an inappropriate government office are re-directed to the appropriate office. The appropriate contact information (phone numbers and addresses) should be posted in the appropriate government offices, particularly in rural Manitoba and should be made available to the appropriate municipal authorities. A toll-free number to which members of the public could report concerns could be established and publicized. Consideration should also be given to measures that allow Manitoba Conservation Environmental Officers to be distinguishable in the field and at public events.

Throughout this report, the Commission has identified the work that various provincial governments are undertaking in relation to agriculture and the environment. Various reports have indicated that, in other jurisdictions, it is not uncommon for there to be tensions between departments mandated with development and environmental protection. It has been suggested to the Commission that similar tensions exist in the Manitoba government. This is neither unexpected nor necessarily unhealthy. At the same time, the Commission believes consideration should be given to the establishment of a steering committee on agri-environmental and societal issues. Issues of interdepartmental and intergovernmental cooperation were also raised by the Auditor General. The Commission agrees with the Auditor General that there are "many advantages in cooperating and communicating with other departments and municipalities."

# 14 Conclusion

## Scenarios for the future

As outlined in Chapter 5, the Manitoba hog-production industry is facing a number of significant challenges. Two of these issues, the increasing value of the Canadian dollar and the U.S. government's coming Country of Origin Label, severely threaten the profitability of Manitoba's exports of live hogs to the United States. In 2006, Manitoba exported 5.4 million hogs (4.1 million weanlings and 1.3 million market hogs) to the U.S. This issue is compounded by the lack of slaughter capacity in Manitoba. While Maple Leaf Foods is adding a second shift at its Brandon plant, this move has been coupled with the loss of slaughter capacity in Winnipeg and Saskatchewan. Furthermore, the proposed OlyWest project appears to be currently in a state of abeyance.

Loss of access to the U.S. market for live hogs could lead to either a reduction in production or an expansion of slaughter capacity and an expansion of the number of hogs being raised to slaughter weight in Manitoba.

A move to increase the number of hogs finished in Manitoba would have environmental implications. For each additional one million hogs finished in Manitoba (as opposed to being exported to the U.S. as weanlings) there would be an increase of 15 to 20 per cent in overall nitrogen and phosphorus production. Approximately 4,200 tonnes of nitrogen and 800 to 1,100 tonnes of phosphorus would be produced (the phosphorus production would vary on the amount of phytase added to the feed). An additional 80,000 to 110,000 hectares of spread fields would be required to maintain a balance between phosphorus application and removal under the current regulations. This would raise the arable land on which hog manure was being applied to between approximately 580,000 to 810,000 hectares, representing 12-16 per cent of Manitoba's agricultural land base (as opposed to 10-15 per cent for current production) (Flaten personal communication).

Finishing the four million weanlings currently shipped to the U.S in Manitoba would produce a 60 to 80 per cent increase in nitrogen and phosphorus and require an additional 320,000 to 440,000 hectares of land.

Although the economic and agricultural future is difficult to predict, particularly given current trends in the value of the Canadian dollar and the price of feed, any future growth in hog production may well take the form of an expansion of finishing barns. As the numbers above suggest, this could lead to a significant increase in nutrient production. While such an increase in the amount of available manure would provide an economic benefit for farmers looking to reduce their reliance on synthetic fertilizers, there would also be need for careful management of the environmental concerns.

The Commission recognizes that given various economic factors, this development may well not materialize. If it does, there is a risk that development will once more become too densely concentrated, creating new regional imbalances. This would be especially true if the recommendations of this report were not implemented.

In the end, the Commission has identified three overriding areas where further action is needed to ensure the industry's environmental sustainability.

The phase-in period for the phosphorus regulation, particularly for areas where there is a serious imbalance in phosphorus application and removal stretches too far in the future. For this reason, it has recommended that full compliance with the phosphorus regulation for all operators be required by 2013.

There is a need for considerable increase in data gathering, compilation, and research in a number of key areas. In particular, the Commission believes it is necessary to prepare for a five-year review of the phosphorus restrictions. The Commission urges the government to ensure that the necessary research and monitoring is undertaken to facilitate a full review of the regulation in five years time.

The approvals process needs to be broadened in terms of the number of issues that it assesses, including broader watershed issues. While the approval process involves many issues other than the regulation of manure phosphorus, the decisions made at this point are crucial in preventing industry concentration from exceeding the landscape's capacity for phosphorus application. As part of a new approvals process, the Commission is recommending that new operations be required to demonstrate that they have a sufficient cropped land base available to balance phosphorus application rates with removal rates over the long-term.

In addition to action in these three areas, the Commission has made recommendations related to the hog production industry's impact on a range of environmental issues including winter application of manure, water supply, water quality, climate change, odour, land-use, biodiversity, and human and animal health. While the Commission does not believe that these issues currently represent a serious barrier to industry sustainability, action now will allow the province and the industry to better manage these issues into the future.

The Commission also wishes to underscore a point that it made at the beginning of this report, namely that this has been an examination of the environmental sustainability of the hog-production industry. The Commission is well aware of the fact that some of its recommendations will have economic impacts for producers. Much of the focus in this report has been on regulation and enforcement. There is an equal, if not more important, role to be played by those who work for the government doing agriculture extension work, environmental farm planning, and in developing programs that reward farmers for providing environmental farm services. When the Manitoba government adopted the new phosphorus regulation, it indicated that it would be providing producers with financial assistance in adjusting to these regulations.

Environmental sustainability is achievable, but it cannot be put off into the future. The challenge for the government will be to develop an implementation strategy that works with producers and other members of society to ensure the industry's social and economic sustainability. In those areas where nutrient production is currently out of balance with the environment's ability to remove those nutrients, the province and producers must move quickly and cooperatively to bring production into balance within the next five years. Given the scenario sketched out at the start of this chapter, the government must put in place a framework that will see that all future growth is balanced growth and that the industry's development is environmentally sustainable.

# 15 Recommendations

9.1 The phase-in dates for the Livestock Manure and Mortalities Management Regulation phosphorus provisions be adjusted so that all operators are required to be fully compliant with the regulation by 2013.

9.2 The ban on the winter application of manure in the Livestock Manure and Mortalities Management Regulation be extended to all operations by 2013.

9.3 The Manitoba government undertake a review of the phosphorus application provisions of the Livestock Mortalities and Manure Management Regulation after the regulation has been in place for five years. The review should include:

- Trends in soil test phosphorus by region.
- Enforcement effectiveness and compliance.
- Effects of soil test phosphorus values on adjacent watercourses/water quality.
- Evaluation of thresholds.
- Evaluation of risk assessment tools.

- Evaluation of management practices to reduce phosphorus-related environmental risks.

Such a review will depend on the availability of a wide range of water quality data. The water monitoring efforts needed to acquire these data should commence immediately.

9.4 The Manitoba government immediately conduct, facilitate, collaborate on and commission research on soil test phosphorus and transport mechanisms that will lead to the calculation of a phosphorus threshold specifically for Manitoba soils and climatic conditions. This research should include an examination of the effectiveness of a phosphorus index for Manitoba. This threshold should be considered in the review of the phosphorus regulation.

9.5 The Manitoba government work with other organizations to develop science-based, environmentally, and economically sound beneficial management practices for reducing phosphorus losses to surface waters under Manitoba's soil, landscape, and climatic conditions.

9.6 The Manitoba government provide livestock operators with financial assistance or incentives to assist them in coming into compliance with the phosphorus provisions of the Livestock Manure and Mortalities Management Regulation. This should include funding for the implementation of effective beneficial management practices.

9.7 The Manitoba government amend the Livestock Manure and Mortalities Management Regulation to require that new and expanding operations be required to demonstrate that they have a sufficient cropped land base available to balance phosphorus application rates with removal rates over the long-term.

9.8 The Manitoba government and industry encourage producers to move to barn and manure-storage facility management that maximizes spring and summer supply and application.

9.9 The Manitoba government facilitate, encourage, and undertake further studies into the cumulative effects of applying manure fertilizer to marginal lands. This should include the examinations of pathogen movement and transfer, and nutrient run-off.

9.10 The Manitoba government assist producers in efforts to adopt and develop techniques that reduce the liquid volume of manure. Such measures would reduce the cost of transporting nutrients, resulting in more effective use of manure nutrients and a reduction in the pressure to convert natural lands to croplands.

9.11 The Manitoba Government reconcile the differences in terminology (particularly in relation to zones and classifications) in the Livestock Mortalities and Manure Management Regulation and the Nutrient Management Regulation.

9.12 The Manitoba government develop a nutrient budget for agricultural Manitoba on a sub-watershed and, ultimately, a watershed basis.

9.13 The Manitoba government facilitate, encourage, and undertake further studies to identify:

- Practices and technologies that can further protect the environment, animals and humans from pathogen distribution from hog production. This should include determining the role played by the nitrogen and phosphorus limits governing manure application in Manitoba and studies of transfer mechanisms.

- Practices and technologies that will effectively reduce or eliminate the pathogen content in agricultural manure in Manitoba. This should include research into the effectiveness of multi-cell storage facilities and whether treatment of manure with ammonia or urea can eliminate pathogens from livestock manure in Manitoba.
- The pathogen related-risks facing hog-production workers and steps that can be taken to eliminate and reduce those risks.
- The incidence of pathogen-related illness and the connection between such illnesses and the livestock sector.
- How pathogens in manure fertilizer, particularly surface-applied fertilizer, may affect wildlife.

9.14 The Manitoba government facilitate, encourage, and undertake further studies in the assessment of heavy metals in Manitoba agricultural soils and potential environmental effects as a result of long-term application of manure.

9.15 The Manitoba government require that, where new above-ground steel or concrete storage facilities are located, dyking be constructed to provide a secondary containment area equal to 110 per cent of the capacity of the structure.

9.16 The Manitoba government require certification of manure-storage facilities operators, similar to the Water and Wastewater Facility Operators certification. As with Water and Waste Facility Operators, certification should be valid for five years.

9.17 Concrete and steel manure-storage structures be inspected every three years by a qualified structural engineer.

9.18 The Manitoba government facilitate, encourage, and undertake further studies with respect to migration of liquid manure seeping through the earth towards an aquifer and the resulting long-term effect on groundwater supplies.

9.19 The Livestock Manure and Mortalities Regulation require compliance with the provisions of the *Technical Reference Manual for Liquid Manure Storage Structures*.

9.20 The Manitoba government report all significant manure-storage facility design changes to the appropriate municipal authorities.

9.21 The Manitoba government continue its policy of having Manitoba Conservation Environment Officers inspect all licensed manure-storage facilities on an annual basis with a priority being given to the high-risk operations.

9.22 The Manitoba government require all new, modified, or expanding hog-production operations to register manure management plans.

9.23 The Manitoba government ensure that Manitoba Conservation has sufficient resources to assess proposed hog-production operations, inspect existing operations on an annual basis, audit 10 per cent of manure management plans annually, register non-permitted manure-storage facilities, and enforce existing manure-management regulations.

9.24 The Manitoba government obtain accurate data on livestock water sources, quality, and usage. This would include the reading of meters at livestock operations by Manitoba Conservation Environment Officers at the time of inspection of manure-storage facilities, the comparison of meter readings with allocated amounts, and the publication of annual summaries of use versus allocation for each sector.

9.25 The Manitoba government compile information on technologies that reduce water usage without compromising animal performance and make this information available to producers.

9.26 The Manitoba government facilitate, encourage, and undertake further studies into water use, water wastage, and water use reduction technologies and practices. This should include:

- The use of water by genotype, production phase, environment and health status.
- The amount of water used by unmetered operations engaged in hog production.
- Animal management strategies and animal housing designs that minimize water usage and wastage and therefore reduce manure volume.
- Waste water recycling for existing operations that may not be able to significantly reduce water use because of design.
- Hog rations that minimize excess nutrients and mineral intake, thus influencing water intake as well as manure output.

10.1 The Manitoba government require that all new manure-storage facilities have synthetic covers (ideally negative pressure covers).

10.2 The Manitoba government require all new and expanding operations to either inject or incorporate manure, with incorporation taking place within 48 hours.

10.3 The Farm Practices Protection Board cease requiring complainants to place a $50 deposit when they file a complaint.

10.4 Manitoba Conservation Environment Officers be given the authority to enforce orders of the Farm Practices Protection Board under their powers under *The Environment Act*.

10.5 The budget of the Farm Practices Protection Board be increased to allow it to undertake more outreach work to make members of the public aware of its services.

10.6 The Manitoba government establish a dispersion-theory-based farm odour guideline. Such a guideline would give consideration to the various factors that affect odour emission and dispersion including topography and technology.

10.7 The Manitoba government facilitate, encourage, and collaborate on the research and data collection in the following areas:

- Standards and procedures for measuring odour emission from barns and manure storage in Manitoba.
- Potential health effects associated with odour downwind from hog operations. These are needed to establish suitable acceptability criteria for community level exposure to odour.
- Emission rates and characteristics of odour from hog operations.

- Downwind distribution of odour and other air contaminants
- Economic analysis of odour mitigation technologies for Manitoba conditions.

11.1 The Manitoba government include biodiversity conservation considerations into its decision-making process regarding the expansion in the livestock sector or significant changes in land use. Policies should identify and respect critical regional wildlife habitats, discourage the conversion of natural habitats to serve as manure spread fields, and discourage the fertilization of native grasslands and prairies.

11.2 The Manitoba government identify ecologically sensitive sites (such as tall and mixed grass prairie remnants) and establish no-manure-application buffer zones around them. These zones should be established in consultation with eco-system specialists and hydrologists on a site-by-site basis.

11.3 The Manitoba government increase the resources of the Workplace Safety and Health Prevention Service Branch to provide for more inspection of hog-production operations.

11.4 The Manitoba government take steps to have a modified version of the National Farm Building Code apply in Manitoba following consultation with concerned parties.

11.5 The Manitoba government take the lead in developing a contingency plan to address the animal welfare consequences of a border closing. The planning should account for both border closings caused by a large-scale animal disease outbreak and those that arise for reasons such as erection of trade barriers.

11.6 The Manitoba government work with producers to develop individual contingency plans to respond to a catastrophic event resulting in mass mortalities.

11.7 The Manitoba government enact regulations under *The Animal Diseases Act* to regulate the sale, use and disposal of drugs for animals. This regulation should include the recording of information on the drug types, volumes, length of treatment, classes of animals being treated, and purposes to which these medications are being used. This information should be compiled, analyzed, and reported to the public on a regular basis.

11.8 The Manitoba government work with the federal government, other provincial governments, and research institutes to establish a comprehensive data collection network on antibiotic resistance in food animals.

11.9 The Manitoba government monitor surface water for microbial contaminants, especially in regions with high concentrations of intensive livestock operations.

11.10 The Manitoba government have hog manure examined for the presence of antibiotics and antibiotic resistant bacteria.

11.11 The Manitoba government facilitate, encourage, and undertake further studies into the efficacy and requirement for the use of antibiotic drugs in feed animals.

12.1 The Manitoba government adopt a new approval process for new, modified, and expanding manure storage-facilities operations as detailed in Chapter 12. Under this process, proponents would submit detailed site assessments that would be screened by a provincial

Technical Advisory Committee coordinated by Manitoba Conservation. The review process would produce a report that would be available to the public, along with the site assessment. This report, the site assessment, and the TAC comments, would go to the municipality and the local offices of relevant provincial departments. Responsibility for determining land-use issues would remain with the municipal authority, while the provincial government would retain responsibility for the issuance of environmental approvals.

13.1 Manitoba Conservation and Manitoba Agriculture, Food and Rural Initiatives develop a common database to record the presence of all Manitoba livestock operations.

13.2 The Manitoba government develop and publish a series of trend reports on the data that it collects and compiles on water quality, soil quality, air quality, and health issues related to the raising of livestock.

13.3 A Watershed Studies Institute be established to coordinate information collection, analysis, and evaluation, direct research and provide support to agencies and organizations undertaking watershed management in Manitoba.

# 15 Recommandations

9.1 Les dates de mise en place progressive des dispositions relatives au phosphore du *Règlement sur la gestion des animaux morts et des déjections du bétail* devraient être ajustées afin que le plein respect de ce règlement, par tous les exploitants, soit atteint en 2013.

9.2 L'interdiction d'épandre des déjections en hiver prévue par le *Règlement sur la gestion des animaux morts et des déjections du bétail* devrait viser toutes les exploitations agricoles d'ici 2013.

9.3 Le gouvernement du Manitoba devrait entreprendre une révision des dispositions sur l'application de phosphore du *Règlement sur la gestion des animaux morts et des déjections du bétail* cinq ans après l'entrée en vigueur de ce règlement. Cette révision devrait envisager :

- les tendances par région des niveaux de phosphore mesurés dans les sols;
- l'efficacité des mesures d'exécution et le respect du règlement;
- les conséquences des quantités de phosphore mesurées dans les sols sur la qualité de l'eau et des cours d'eau environnants;

- l'évaluation de seuils;
- l'évaluation des outils d'analyse des risques;
- l'évaluation des pratiques de gestion employées pour réduire les risques environnementaux liés au phosphore.

Cette révision ne sera possible que s'il existe une large gamme de données sur la qualité de l'eau. Il faudrait donc commencer immédiatement les efforts de surveillance de la qualité de l'eau requis pour obtenir ces données.

9.4 Le gouvernement du Manitoba devrait immédiatement entreprendre, faciliter et commanditer des recherches sur le phosphore mesuré dans les sols et les mécanismes de transport de cet élément en vue de calculer un seuil de phosphore caractéristique des sols et des conditions climatiques du Manitoba et collaborer à de telles recherches. Ces recherches devraient comprendre l'examen de l'efficacité d'un index de phosphore pour le Manitoba. Ce seuil de phosphore devrait être pris en compte lors de la révision des dispositions réglementaires sur le phosphore.

9.5 Le gouvernement du Manitoba devrait travailler en collaboration avec d'autres organismes afin de mettre au point des pratiques de gestion agricole bénéfiques basées sur les connaissances scientifiques, respectueuses de l'environnement et économiquement viables afin de réduire les pertes de phosphore par ruissellement de surface pour les sols, le paysage et le climat du Manitoba.

9.6 Le gouvernement du Manitoba devrait fournir aux éleveurs de bétail un appui financier ou mettre en place des mesures incitatives afin d'aider les exploitants à se conformer aux dispositions relatives au phosphore du *Règlement sur la gestion des animaux morts et des déjections du bétail*. Cela devrait comprendre un financement pour la mise en place de pratiques de gestion agricole bénéfiques efficaces.

9.7 Le gouvernement du Manitoba devrait modifier le *Règlement sur la gestion des animaux morts et des déjections du bétail* afin que les nouvelles exploitations et celles qui s'agrandissent soient obligées de démontrer qu'elles disposent d'une superficie de terres cultivées suffisante pour que les taux d'application et d'élimination de phosphore puissent s'équilibrer à long terme.

9.8 Le gouvernement du Manitoba et l'industrie devraient encourager les producteurs à gérer les étables et les installations de stockage de déjections de manière à maximiser l'approvisionnement et les applications au printemps et en été.

9.9 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires sur les effets cumulatifs de l'épandage de déjections sur les terres marginales. Cela devrait inclure l'examen des mouvements et des transferts de pathogènes et du ruissellement des nutriants.

9.10 Le gouvernement du Manitoba devrait aider les producteurs dans leurs efforts à utiliser ou à concevoir des techniques qui réduisent le volume de déjections liquides. De telles mesures permettraient de réduire le coût de transport des nutriants, ce qui rendrait l'utilisation des nutriants contenus dans les déjections plus efficace et permettrait de diminuer la pression à transformer des terres naturelles en terres cultivées.

9.11 Le gouvernement du Manitoba devrait éliminer les différences terminologiques (surtout en ce qui concerne les zones et les classifications) qui existent entre le *Règlement sur la gestion des animaux morts et des déjections du bétail* et le *Règlement sur la gestion des nutriants.*

9.12 Le gouvernement du Manitoba devrait établir des bilans nutritifs pour les régions agricoles du Manitoba à l'échelle des sous-bassins hydrographiques puis ultérieurement, à l'échelle des bassins complets.

9.13 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires afin de déterminer :

- des pratiques et des technologies qui protègent davantage l'environnement, les animaux et les humains de la propagation de pathogènes issus d'exploitations porcines. Pour cela, il faudrait notamment déterminer le rôle joué par les limites d'azote et de phosphore gouvernant l'épandage de déjection au Manitoba et étudier les mécanismes de transfert;
- des pratiques et des technologies qui permettent d'éliminer les pathogènes ou d'en réduire efficacement les quantités dans les déjections du bétail au Manitoba. Pour cela, il faudrait notamment effectuer des recherches sur l'efficacité des installations de stockage à plusieurs bassins et chercher à savoir si le traitement des déjections du bétail avec de l'ammoniaque ou de l'urée permettrait, dans le contexte manitobain, d'éliminer les pathogènes des déjections;
- les risques auxquels sont confrontées les personnes qui travaillent dans des exploitations porcines en raison de la présence de pathogènes et les mesures qui peuvent être prises pour éliminer ou réduire ces risques;
- l'incidence de maladies découlant de pathogènes et les liens qui existent entre ces maladies et le secteur de l'élevage;
- les répercussions que les déjections utilisées comme engrais peuvent avoir sur la faune, en particulier dans le cas des épandages en surface.

9.14 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires afin d'évaluer la quantité de métaux lourds dans les terres agricoles du Manitoba et les effets potentiels que l'épandage de déjections pourrait avoir sur l'environnement à long terme.

9.15 Le gouvernement du Manitoba devrait exiger que toutes les nouvelles installations de stockage des déjections en acier ou en béton construites au-dessus du sol soient entourées d'une digue permettant l'endiguement d'un volume égal à 110 % de la capacité de l'installation de stockage.

9.16 Le gouvernement du Manitoba devrait exiger que les exploitants d'installation de stockage des déjections soient accrédités d'une manière similaire à ce qui se fait pour les exploitants d'installations de traitement des eaux. De plus, les certificats visant les installations de stockage des déjections devraient être valides pour cinq ans, tout comme ceux visant les installations de traitement des eaux.

9.17 Les installations de stockage des déjections en béton ou en acier devraient être inspectées tous les trois ans par un ingénieur ou une ingénieure des structures qualifié.

9.18 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires sur la migration des déjections liquides dans les sols vers les aquifères et sur les conséquences que cela pourrait avoir à long terme sur les ressources en eau souterraines.

9.19 Il faudrait uniformiser les dispositions du *Règlement sur la gestion des animaux morts et des déjections du bétail* avec celles du *Technical Reference Manual for Liquid Manure Storage Structures* (manuel de référence technique pour les structures de stockage des déjections liquides).

9.20 Le gouvernement du Manitoba devrait signaler tous les changements importants quant à la conception des installations de stockage des déjections aux autorités municipales compétentes.

9.21 Le gouvernement du Manitoba devrait maintenir sa politique consistant à envoyer ses agents de l'environnement effectuer des inspections des installations de stockage des déjections visées par un permis sur une base annuelle, en donnant la priorité aux exploitations à haut risque.

9.22 Le gouvernement du Manitoba devrait exiger que toutes les nouvelles exploitations porcines et toutes celles qui sont modifiées ou agrandies soient tenues de déposer des plans de gestion des déjections.

9.23 Le gouvernement du Manitoba devrait s'assurer que le ministère de la Conservation dispose de ressources suffisantes pour évaluer les propositions d'exploitations porcines, pour inspecter les exploitations existantes sur une base annuelle, pour vérifier 10 % des plans de gestion des déjections annuellement, pour enregistrer les installations de stockage des déjections non encore autorisées et pour mettre en application la réglementation existante sur la gestion des déjections.

9.24 Le gouvernement du Manitoba devrait obtenir des données précises sur les sources d'eau employées pour le bétail, leur qualité et leur utilisation. Cela consisterait notamment à faire une lecture des compteurs dans les exploitations d'élevage par les agents de l'environnement du ministère au moment de l'inspection des installations de stockage des déjections, une comparaison des lectures de compteurs avec les quantités allouées et une publication de résumés annuels comparant la consommation d'eau aux quantités allouées pour chaque secteur.

9.25 Le gouvernement du Manitoba devrait compiler des renseignements sur les technologies qui permettent de réduire l'utilisation d'eau sans compromettre la performance des animaux et mettre ces renseignements à la disposition des producteurs.

9.26 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires sur l'utilisation de l'eau, le gaspillage d'eau et les technologies et les pratiques permettant de réduire la consommation d'eau. Ces études devraient notamment porter sur :

- l'utilisation de l'eau en fonction du génotype, de la phase de production, de l'environnement et de la santé de l'animal;
- les quantités d'eau utilisées dans les exploitations porcines n'ayant pas de compteur d'eau;
- les stratégies de gestion des animaux et la conception des bâtiments d'élevage qui minimisent l'utilisation et le gaspillage d'eau et permettent par conséquent de réduire le volume de déjections;
- le recyclage des eaux usées pour les exploitations existantes qui ne

pourraient pas réduire de manière significative leur utilisation d'eau en raison de problèmes de conception;

- les rations alimentaires qui minimisent les nutriants excédentaires et les apports de minéraux, ce qui peut par conséquent jouer sur l'apport d'eau et la production de déjections.

10.1 Le gouvernement du Manitoba devrait exiger que toutes les nouvelles installations de stockage des déjections soient recouvertes d'une couverture en matière synthétique (idéalement d'une couverture à pression négative).

10.2 Le gouvernement du Manitoba devrait exiger que toutes les nouvelles exploitations et que celles qui s'agrandissent injectent les déjections du bétail ou les incorporent dans les sols dans les 48 heures après l'épandage.

10.3 La Commission de protection des pratiques agricoles ne devrait plus réclamer un dépôt de 50 $ aux plaignants lorsqu'ils déposent une plainte.

10.4 Les agents de l'environnement du ministère de la Conservation du Manitoba devraient être autorisés à faire respecter les ordonnances de la Commission de protection des pratiques agricoles en vertu des pouvoirs qui leurs sont conférés par la *Loi sur l'environnement*.

10.5 Le budget de la Commission de protection des pratiques agricoles devrait être augmenté afin de lui permettre d'entreprendre plus d'actions pour faire connaître les services qu'elle offre au public.

10.6 Le gouvernement du Manitoba devrait mettre en place une ligne directrice sur les odeurs des exploitations agricoles basée sur les théories de dispersion des odeurs. Une telle ligne directrice prendrait en considération les divers facteurs qui jouent un rôle dans l'émission et la dispersion des odeurs, y compris la topographie et la technologie.

10.7 Le gouvernement du Manitoba devrait faciliter et encourager les recherches et la collecte de données, et y collaborer, dans les domaines suivants :

- les normes et les procédures pour mesurer les émissions olfactives provenant des étables et des installations de stockage des déjections au Manitoba;
- les effets potentiels sur la santé des odeurs provenant des exploitations porcines dans les zones situées en aval des exploitations dans la direction du vent. Ces renseignements sont indispensables pour établir des critères valables d'exposition acceptable aux odeurs dans les collectivités;
- les taux d'émission et les caractéristiques des odeurs provenant des exploitations porcines;
- la distribution des odeurs et des autres contaminants atmosphériques en aval des exploitations dans la direction du vent;
- l'analyse économique des technologies d'atténuation des odeurs pour les conditions du Manitoba.

11.1 Le gouvernement du Manitoba devrait envisager la conservation de la biodiversité dans son processus de prise de décision relatif à l'expansion du secteur de l'élevage ou à un changement significatif d'une utilisation des terres. Les politiques devraient définir et respecter les habitats fauniques régionaux critiques et décourager la conversion d'habitats naturels en champs d'épandage de déjections ainsi que la fertilisation des surfaces pastorales et des prairies indigènes.

11.2 Le gouvernement du Manitoba devrait définir les sites écosensibles (comme les vestiges de prairie à herbes hautes et de prairie mixte) et établir des zones tampon autour de ces sites où il serait interdit de faire des applications de déjections. Ces zones devraient être établies en consultation avec des spécialistes des écosystèmes et des hydrologues, au cas par cas.

11.3 Le gouvernement du Manitoba devrait accroître les ressources de la Direction des services de prévention de la Division de la sécurité et de l'hygiène du travail afin qu'elle puisse effectuer plus d'inspections d'exploitations porcines.

11.4 Le gouvernement du Manitoba devrait prendre des mesures pour qu'une version modifiée du *Code national de construction des bâtiments agricoles* soit appliquée au Manitoba suite à des consultations avec les parties concernées.

11.5 Le gouvernement du Manitoba devrait diriger l'élaboration d'un plan de secours pour faire face aux conséquences qu'entraînerait une fermeture de la frontière avec les États-Unis pour le bien-être des animaux. La planification devrait envisager non seulement les fermetures de frontière motivées par une épidémie animale à grande échelle, mais aussi par la volonté de créer un obstacle au commerce.

11.6 Le gouvernement du Manitoba devrait travailler avec les producteurs pour élaborer des plans de secours individuels afin de répondre à des situations catastrophiques entrainant une mortalité massive.

11.7 Le gouvernement du Manitoba devrait promulguer des règlements en application de la *Loi sur les maladies des animaux* afin de réglementer la vente, l'utilisation et l'élimination des médicaments pour les animaux. Ce règlement devrait prévoir que le type et les volumes de médicament utilisés, les durées de traitement, les classes d'animaux traités et les raisons pour lesquelles ces médicaments ont été utilisés soient consignés. Ces renseignements devraient être rassemblés et analysés régulièrement et présentés au public.

11.8 Le gouvernement du Manitoba devrait travailler avec le gouvernement fédéral, les autres gouvernements provinciaux et des instituts de recherche afin d'établir un réseau de collecte de données étendu sur la résistance aux antibiotiques des animaux destinés à l'alimentation.

11.9 Le gouvernement du Manitoba devrait surveiller la composition microbienne des eaux de surface pour détecter d'éventuels contaminants, surtout dans les régions où il y a une grande concentration d'exploitations porcines intensives.

11.10 Le gouvernement du Manitoba devrait faire examiner la composition des déjections porcines afin de détecter la présence d'antibiotiques et de bactéries résistantes aux antibiotiques.

11.11 Le gouvernement du Manitoba devrait faciliter, encourager et entreprendre des études complémentaires sur l'efficacité des antibiotiques chez les animaux destinés à l'alimentation et sur les exigences quant à leur utilisation.

12.1 Le gouvernement du Manitoba devrait adopter un nouveau processus d'agrément pour la mise en service des nouvelles installations de stockage des déjections et de celles qui sont modifiées ou agrandies, comme l'explique en détail le chapitre 12. Selon ce processus, les promoteurs devraient déposer une évaluation détaillée du site qui serait examinée par un comité consultatif technique provincial coordonné par Conservation Manitoba. Le processus de révision aboutirait à la préparation d'un rapport qui serait mis à la disposition du public, tout comme l'évaluation du site. Ce rapport, l'évaluation du site et les commentaires du comité consultatif technique seraient transmis à la municipalité et aux bureaux régionaux des ministères provinciaux concernés. Les administrations municipales conserveraient la responsabilité de trancher sur les questions liées à l'utilisation des terres et le gouvernement provincial garderait le pouvoir de délivrer les autorisations environnementales.

13.1 Conservation Manitoba et Agriculture, Alimentation et Initiatives rurales Manitoba devraient mettre en place une base de données commune pour enregistrer toutes les exploitations d'élevage qui existent au Manitoba.

13.2 Le gouvernement du Manitoba devrait concevoir et publier une série de rapports de tendances à partir des données qu'il recueille et rassemble sur la qualité de l'eau, des sols et de l'air et sur les questions de santé liées au secteur de l'élevage.

13.3 Un institut de recherche sur les bassins hydrologiques devrait être mis en place afin de coordonner la collecte de renseignements, les analyses, les évaluations et les recherches directes et d'offrir un soutien aux agences et aux organismes qui s'occupent de la gestion de bassins hydrologiques au Manitoba.

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# Appendix 1

## Principles and Guidelines for Sustainable Development

### Principles

*1. Integration of Environmental and Economic Decisions*

1(1) Economic decisions should adequately reflect environmental, human health and social effects.

1(2) Environmental and health initiatives should adequately take into account economic, human health and social consequences.

*2 Stewardship*

2(1) The economy, the environment, human health and social well-being should be managed for the equal benefit of present and future generations.

2(2) Manitobans are caretakers of the economy, the environment, human health and social well-being for the benefit of present and future generations.

2(3) Today's decisions are to be balanced with tomorrow's effects.

*3 Shared Responsibility and Understanding*

3(1) Manitobans should acknowledge responsibility for sustaining the economy, the environment, human health and social well-being, with each being accountable for decisions and actions in a spirit of partnership and open cooperation.

3(2) Manitobans share a common economic, physical and social environment.

3(3) Manitobans should understand and respect differing economic and social views, values, traditions and aspirations.

3(4) Manitobans should consider the aspirations, needs and views of the people of the various geographical regions and ethnic groups in Manitoba, including aboriginal peoples, to facilitate equitable management of Manitoba's common resources.

*4 Prevention*

Manitobans should anticipate, and prevent or mitigate, significant adverse economic, environmental, human health and social effects of decisions and actions, having particular careful regard to decisions whose impacts are not entirely certain but which, on reasonable and well-informed grounds, appear to pose serious threats to the economy, the environment, human health and social well-being.

*5 Conservation and Enhancement*

Manitobans should

(a) maintain the ecological processes, biological diversity and life-support systems of the environment;

(b) harvest renewable resources on a sustainable yield basis;

(c) make wise and efficient use of renewable and non-renewable resources; and

(d) enhance the long-term productive capability, quality and capacity of natural ecosystems.

*6 Rehabilitation and Reclamation*

Manitobans should

(a) endeavour to repair damage to or degradation of the environment; and

(b) consider the need for rehabilitation and reclamation in future decisions and actions.

*7 Global Responsibility*

Manitobans should think globally when acting locally, recognizing that there is economic, ecological and social interdependence among provinces and nations, and working cooperatively, within Canada and internationally, to integrate economic, environmental, human health and social factors in decision-making while developing comprehensive and equitable solutions to problems.

## Guidelines

*1 Efficient Use of Resources - which means*

(a) encouraging and facilitating development and application of systems for proper resource pricing, demand management and resource allocation together with incentives to encourage efficient use of resources; and

(b) employing full-cost accounting to provide better information for decision makers.

*2 Public Participation - which means*

(a) establishing forums which encourage and provide opportunity for consultation and meaningful participation in decision making processes by Manitobans;

(b) endeavouring to provide due process, prior notification and appropriate and timely redress for those adversely affected by decisions and actions; and

(c) striving to achieve consensus amongst citizens with regard to decisions affecting them.

3 Access to Information - which means

(a) encouraging and facilitating the improvement and refinement of economic, environmental, human health and social information; and

(b) promoting the opportunity for equal and timely access to information by all Manitobans.

*4 Integrated Decision Making and Planning*

- which means encouraging and facilitating decision making and planning processes that are efficient, timely, accountable and cross-sectoral and which incorporate an inter-generational perspective of future needs and consequences.

*5 Waste Minimization and Substitution -* which means

(a) encouraging and promoting the development and use of substitutes for scarce resources where such substitutes are both environmentally sound and economically viable; and

(b) reducing, reusing, recycling and recovering the products of society.

*6 Research and Innovation*

- which means encouraging and assisting the researching, development, application and sharing of knowledge and technologies which further our economic, environmental, human health and social well-being.

## Appendix 2

# Guide to Public Participation in the Clean Environment Commission Hog Production Industry Review

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### The investigation

On November 8, 2006 Manitoba Conservation Minister Stan Struthers instructed the Manitoba Clean Environment Commission to conduct an investigation into the environmental sustainability of hog production in Manitoba. For this purpose, the CEC was asked to conduct public meetings and provide advice and recommendations to the Minister. The Minister provided the following terms of reference for the investigation.

1. The CEC, as a part of its investigation will review the current environmental protection measures now in place relating to hog production in Manitoba in order to determine their effectiveness for the purpose of managing hog production in an environmentally sustainable manner.

2. The CEC investigation must include a public component to gain advice and feedback from Manitobans. This public component should be conducted by means of public meetings in the various regions of Manitoba to ensure broad participation from the general public and affected stakeholders.

3. The CEC investigation should include a review of the contents of the report prepared by Manitoba Conservation entitled "An Examination of the Environmental Sustainability of the Hog Industry in Manitoba."

4. The CEC will, as part of this investigation, take into account the efforts underway in other jurisdictions to manage hog production in a sustainable manner.

5. As part of its investigation, and based on public feedback, the commission will consider various options and make recommendations in a report to the Minister on any improvements that may be necessary to provide for the environmental sustainability of hog production in Manitoba.

Manitoba
CLEAN·ENVIRONMENT
COMMISSION

Manitoba

## The Clean Environment Commission

The Clean Environment Commission is an arms-length provincial agency established under *The Environment Act* of Manitoba. The Commission encourages and facilitates public involvement in environmental matters and offers advice and recommendations to the Minister of Conservation with respect to environmental issues, project approvals, and environmental licenses. A three-person panel has been struck to carry out the hog production investigation. The Panel is being chaired by CEC Chairperson Terry Sargeant.

## Public input on the scope of the investigation

To assist in defining the scope of the investigation, the Commission held three days of meetings in January 2007 in Friedensfeld (in south-eastern Manitoba), Winnipeg, and Morden (in south-central Manitoba). A wide range of individuals and organizations made presentations at these meetings, both identifying issues they believed should be either within or outside of this scope of this investigation and identifying specific concerns with hog production in Manitoba.

## The scope of the investigation

The Clean Environment Commission's work is shaped by *The Environment Act* of Manitoba and *The Sustainable Development Act* of Manitoba. Drawing on the definitions in those Acts, it interprets the focus of this Investigation to be an inquiry into the impact of the hog-production industry on the indefinite sustainability of Manitoba's physical and biological world. The Commission also notes that Manitoba's Principles and Guidelines for Sustainable Development stress the inter-relationship of economic, environmental, social, and human-health decision-making, recognizing that the decisions made in one sphere have impacts on the others. While the focus of this investigation will be on the impact that hog production has on the sustainability of the Manitoba environment, the Commission will integrate economic, human-health, and social factors in its analysis and recommendations.

## Public meetings

The terms of references of this investigation call on the Commission to conduct public meetings in the various regions of Manitoba to ensure broad participation from the general public and affected stakeholders. Those meetings will be held in March and April of 2007.

The meetings will be open to all members of the public: including presenters, observers and the media. Those who wish to make presentations are invited to register with the Commission seven (7) days before the community session at which they wish to appear. Should time allow, individuals who register at the hearing may also make presentations. Those who wish to register should consult the website (www.cecmanitoba.ca) or contact the Commission directly at 204-945-7091 or 800-597-3556 (toll free number for rural residents). Presentations will be limited to 15 minutes unless prior arrangements have been made with the Commission Secretary. Presenters may appear only once before the Panel during these meetings. Written submissions are also accepted, the deadline for these submissions is May 7, 2007.

In keeping with the provisions of *The Evidence Act* members of the public who make presentations at these meetings will be sworn in. While the Panel members will question presenters, there will be no provision for members of the public to question or cross-examine presenters. All proceedings of these meetings will be transcribed and made available to the public through the CEC website. All submissions made to the commission during the public sessions will also be made available through the CEC website. Members of the public may also submit written responses, clarifications, or comments relating to issues raised at the meetings, these comments are required by May 7, 2007.

Given the scope of the investigation, the CEC is particularly interested in hearing from the public on the following issues:

- Nutrient management
- Manure management
- Land use planning and approval
- Groundwater quality
- Groundwater supply
- Surface water quality
- Soil quality
- Odour
- Disease transmission
- Climate change
- Environmental liability
- The approach taken to these issues in other jurisdictions

In their discussions of any of the above topics, members of the public are encouraged to address such issues as existing legislation and regulations, training requirements, current practice, alternatives, inspection, enforcement, overall impact on environmental sustainability, and the efforts underway in other jurisdictions to manage these issues.

## Participant Assistance

Small financial awards will be available to assist local, community, agricultural and environmental groups and individuals to prepare presentations to be made to these hearings. The deadline for application for this support has been removed and requests will be accepted until the conclusion of the public meetings. For further information on these funds consult the website or contact the Commission directly.

## Research

As a part of this investigation the Commission also intends to engage academic research in a number of areas. This research will be posted on the Commission website during the course of the investigation.

Manitoba Clean Environment Commission
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800-597-3556 (toll free in Manitoba)
Fax: 204-945-0090
e-mail: cathy.johnson@gov.mb.ca
website: www.cecmanitoba.ca

# Dates and locations for the Manitoba Clean Environment Commission Hog Production Industry Review Hearings

| | | | | |
|---|---|---|---|---|
| March 5, 2007 | Winnipeg | Delta Winnipeg | 350 St. Mary Avenue | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 6, 2007 | Stonewall | Royal Canadian Legion | 459 Main Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 8, 2007 | Arborg | Arborg/Bifrost Community Centre | On Ingolfs Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 12, 2007 | Morden | Morden Friendship Centre | 306 North Railway Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 13, 2007 | Killarney | Royal Canadian Legion | 112 Finlay Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 14, 2007 | St. Claude | St. Claude Recreation Centre | 58 Provincial Road 240 | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 15, 2007 | Emerson | Emerson Community Complex | 101 Church Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| March 20, 2007 | Dauphin | Ukrainian Catholic Hall | 11th Avenue Hall | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 10, 2007 | Whitemouth | Whitemouth Recreation Centre | Henderson Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 11, 2007 | Friedensfeld | Friedensfeld Community Centre | 3 Km South of Steinbach on Highway 12 | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 12, 2007 | Friedensfeld | Friedensfeld Community Centre | 3 Km South of Steinbach on Highway 12 | 9:00 – 5:00 p.m. |
| April 16, 2007 | Virden | Elks Hall | 227-3rd Avenue South | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 17, 2007 | Hamiota | Hamiota & District Sports Complex | 200 Maple Avenue East | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 18, 2007 | Brandon | Keystone Agricultural Centre | #1-1175 18th Street | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 19, 2007 | Brandon | Keystone Agricultural Centre | #1-1175 18th Street | 9:00 – 5:00 p.m. |
| April 25, 2007 | Portage la Prairie | Canad Inn | 2401 Saskatchewan Avenue | 1:00 – 5:00 p.m.<br>7:00 – 9:00 p.m. |
| April 27, 2007 | Winnipeg | Radisson Hotel Winnipeg Downtown | 288 Portage Avenue | 9:00 – 5:00 p.m. |

# Appendix 3

## Participants in the public portion of the Investigation

### Presenters to the Public Meetings

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Adema, Matt | Private | Portage |
| **Arklie, C. Hugh** | **Private** | **Whitemouth** |
| Armbruster, Ray | Manitoba Cattle Producers Association | Portage |
| **Bailey, Lorne** | **Deerboine Colony** | **Brandon** |
| Barkley, Barbara | Private | Virden |
| **Barnes, David** | **Private** | **Brandon** |
| Baron, Alan | Private | Brandon |
| **Bell, Ron** | **Association of Manitoba Municipalities** | **Portage** |
| Blackbird, Dwayne | Keeseekoowenin Ojibway Nation | Brandon |
| **Blixhavn, Gerry** | **Private** | **Killarney** |
| Blixhavn, Jeff | Private | Killarney |
| **Bruneau, Bob** | **RM of Lac du Bonnet** | **Whitemouth** |
| Bryksa, Tracy | Manitoba Pork Council | Winnipeg |
| **Burns, Vicki** | **Winnipeg Humane Society** | **Winnipeg** |
| Caners, Alan | Private | Arborg |
| **Cavers, Doug** | **RM of Hanover** | **Friedensfeld** |
| Cherepak, Bob | Private | Arborg |
| **Clayton, Liz** | **Private** | **St. Claude** |
| Clegg, Carol | Private | Whitemouth |
| **Clubb, Lindy** | **Wolfe Creek Conservation Group** | **Winnipeg** |
| Cochrane, Bill | Private | Arborg |
| **Comte, Real** | **Private** | **St. Claude** |
| Cousins, Irene | Private | Virden |
| **Dalgarno, Bruce** | **Private** | **Brandon** |
| Davy, Robert | RM Lorne | St. Claude |
| **Derenchuk, George** | **Private** | **Winnipeg** |
| Desilets, Roger | Private | Hamiota |
| **Dick, Scott** | **Maple Leaf** | **Brandon** |
| Dickson, Andrew | Manitoba Pork Council | Winnipeg |
| **Dirks, Cal** | **Private** | **Whitemouth** |
| Dolecki, Joe | Private | Virden |
| **English, Clair** | **Private** | **Hamiota** |
| Enns, Walter | Cargill Ltd. | Friedensfeld |
| **Ewacha, Curtis** | **Private** | **Winnipeg** |

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Fefchak, John | Private | Virden |
| **Ferriss, Bryan** | **Porkchop Enterprises Ltd.** | **Dauphin** |
| Francois, Twyla | Animals' Angels | Winnipeg |
| **Freedy, Joe** | **J and R Livestock Consultants** | **Brandon** |
| Frieg, Ab | Puratone | Friedensfeld |
| **Friesen, Karen** | **Tourand Farms** | **Friedensfeld** |
| Friesen, Wendy | Private | Morden |
| **Froese, Beverly** | **Public Interest Law Centre** | **Portage** |
| Froese, Harold | Manitoba Egg Producers | Winnipeg |
| **Gibson, Janine** | **Organic Food Council of Manitoba** | **Portage** |
| Giesbrecht, Daniel | Private | Brandon |
| **Graydon, Cliff** | **Private** | **Emerson** |
| Gregory, Eric | James Richardson International | Friedensfeld |
| **Grenier, Adrien** | **Private** | **Friedensfeld** |
| Gross, Andy | Mayfair Colony | Killarney |
| **Gross, Irvin** | **Rolling Acres Colony** | **Dauphin** |
| Gross, Sam | Clearview Colony | Portage |
| **Gurney, Dean** | **Puratone** | **Virden** |
| Harris, Harry | Alonsa Conservation District | Dauphin |
| **Harrison, Bill** | **Private** | **St. Claude** |
| Hazzledine, Mick | Nutrition Partners | Friedensfeld |
| **Heaman, Vince** | **Private** | **Virden** |
| Hedges, Murray | Private | Arborg |
| **Hedman, Louise** | **Private** | **Winnipeg** |
| Hersak, Mickey | Private | Hamiota |
| **Hiebert, Mary Jane** | **Steinbach Chamber of Commerce** | **Friedensfeld** |
| Hofer, Ben | Rock Lake Colony | Stonewall |
| **Hofer, Edward** | **James Valley Colony** | **St. Claude** |
| Hofer, Edwin | Miami Colony | Morden |
| **Hofer, Jake** | **Deerboine Colony** | **Brandon** |
| Hofer, James | Starlite Colony | Portage |
| **Hofer, Larry** | **Marble Ridge Colony** | **Arborg** |
| Hofer, Mel | Deerboine Colony | Brandon |
| **Hofer, Phillip** | **James Valley Colony** | **St. Claude** |
| Hofer, Robert | Wellwood Colony | Killarney |
| **Hofer, Sam** | **Spring Valley Colony** | **Brandon** |

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Hofer, Tim | Willow Creek Colony | Killarney |
| Hombach, Peter | Deerboine Colony | Brandon |
| Hunter, Archie | RM of Franklin | Emerson |
| Johnson, Byron | Private | Killarney |
| Johnston, Ron | Private | Arborg |
| Keating, Lyle | Private | Hamiota |
| Kentner, Carole | Private | Killarney |
| King, Dwight | RM of Killarney-Turtle Mountain | Killarney |
| Kleinsasser, Ed | Sunnyside Colony | Portage |
| Kleinsasser, Jonathan | Crystal Springs Colony | Friedensfeld |
| Kleinsasser, Mr. | Rock Lake Colony | Stonewall |
| Kleinsasser, Raymond | Sunnyside Colony | Portage |
| Klippenstein, Dan | Excel Playgreen | Friedensfeld |
| Koroluk, Glen | Beyond Factory Farming | Portage |
| Kroeker, John | Penner Farm Service | Friedensfeld |
| Kynoch, Karl | Manitoba Pork Council | Winnipeg |
| Kynock, David | Rolling Acres, Grass River, and Riverside Colonies | Dauphin |
| Leschyshyn, Joe | Private | Arborg |
| Lins, Scott | Private | Emerson |
| Loewen, Lyle | Private | Emerson |
| Loveridge, Carol | MFL Occupational Health Centre | Friedensfeld |
| Ludwick, Diana | MFL Occupational Health Centre | Friedensfeld |
| Mackie, Craig | Private | Stonewall |
| Mackling, Al | Private | Winnipeg |
| Maendel, Cameron | Fairholme Colony, | St. Claude |
| Maendel, Gerry | New Rosedale Colony | St. Claude |
| Maendel, Larry, | Blue Clay Colony | Emerson |
| Maendel, Mike | Blue Clay Colony | Emerson |
| Maendel, Mike | Suncrest Colony | Friedensfeld |
| Maendel, Rick | Fairholme Colony | St. Claude |
| Magwood, Marvin | Private | Killarney |
| Mah, Peter | Manitoba Pork Council | Winnipeg |
| Manchur, David | Private | Dauphin |
| Manness, Peter | Private | Portage |
| Martens, Herm | RM of Morris | Morden |
| Marykuca, Peter | Private | Arborg |

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Massey, Bill | Concerned Citizens of Grosse Isle | Stonewall |
| **Matheson, George** | **Private** | **Stonewall** |
| McCowan, Jim | Concerned Citizens of Grosse Isle | Stonewall |
| **McEwan, Les** | **Deerwood Soil and Water Association** | **Morden** |
| McFadden, Wanda | Manitoba Farm Stewardship Association | Winnipeg |
| **McKay, Robert** | **McKay GENSTAT Consultants** | **Brandon** |
| McLean, Robert | Private | Morden |
| **McNaughton, Jason** | **MaxPro Feeds** | **Arborg** |
| Neumann, Sieg | RM of Morris | Morden |
| **Newton, Weldon** | **Private** | **Brandon** |
| Nichol, Miriam | Private | Killarney |
| **Nichol, Wayne** | **Private** | **Killarney** |
| Nikiforuk, Andrew | Springfield Hog Alert | Winnipeg |
| **Orchard, Gordon** | **Deerwood Soil and Water Association** | **Morden** |
| Pauls, Darcy | Puratone | Arborg |
| **Pavelin, George** | **Private** | **Dauphin** |
| Penner, Calvin | Private | Stonewall |
| **Penner, Jack** | **MLA Emerson** | **Emerson** |
| Penner, Zack | Private | Virden |
| **Peters, Lyle** | **Private** | **Friedensfeld** |
| Peters, Rick | Steve's Livestock Transport | Friedensfeld |
| **Pip, Eva** | **University of Winnipeg** | **Whitemouth** |
| Plett, Ray | Private | Friedensfeld |
| **Plett, Ron** | **Private** | **Arborg** |
| Poetker, Alf | Private | St. Claude |
| **Poetker, Bill** | **Private** | **Killarney** |
| Powell, Larry | Private | Dauphin |
| **Prejet, Normand** | **Private** | **St. Claude** |
| Prejet, Rick | Private | St. Claude |
| **Preun, John** | **Manitoba Pork Marketing** | **Stonewall** |
| Prychun, Patrick | Impact Products | Brandon |
| **Pryzner, Ruth** | **Private** | **Brandon** |
| Ransom, Alan | Manitoba Farm Stewardship Association | Winnipeg |
| **Redekop, Doug** | **Keystone Organic Nutrient Applicators Associaton** | **Winnipeg** |

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Remple, Marg | Rempelco Acres Ltd. | Friedensfeld |
| **Rogasin, Al** | **Private** | **Brandon** |
| Rolfe, David | Keystone Agricultural Producers | Brandon |
| **Ross, Ted** | **Roseisle Creek Watershed Association** | **Portage** |
| Routledge, Scott | Private | Hamiota |
| **Schinkel, Bob** | **Private** | **Friedensfeld** |
| Schnell, Brad | Agri-trend | St. Claude |
| **Senff, Bob** | **Private** | **Virden** |
| Sharpe, Martin | Private | Brandon |
| **Shepherd, John** | **Private** | **Virden** |
| Shepherd, Kim | Private | Virden |
| **Sheridan, Mike** | **Sheridan Heuser Provis Swine Health Services** | **Brandon** |
| Siemens, Kurt | Private | Emerson |
| **Silinski, Shanyn** | **Manitoba Farm Animal Council** | **Driedensfeld** |
| Smith, Cheryl | Sandpiper Beach/Lake Manitoba Estates | Portage |
| **Smith, Randy** | **Sandpiper Beach/Lake Manitoba Estates** | **Portage** |
| Stahl, Edward | Grass River Colony | Dauphin |
| **Stead, David** | **RM of Morton** | **Killarney** |
| Steendam, John | Private | Whitemouth |
| **Storey, Kate** | **Private** | **Dauphin** |
| Stott, Sheldon | Hytek | Friedensfeld |
| **Street, Brandy** | **Manitoba Manure Management and Livestock Initiative** | **Winnipeg** |
| Swann, Bert | Hamiota Economic Development Corporation | Hamiota |
| **Sweetnam, Miriam** | **Private** | **Morden** |
| Tait, Fred | HogWatch Manitoba | Portage |
| **Tannas, Lorne** | **Private** | **Hamiota** |
| Tibbets Fefchak, Norma | Private | Virden |
| **Timmerman, Raymond** | **Private** | **St. Claude** |
| Toews, Stan | Private | Friedensfeld |
| **Tolton, Garry** | **Private** | **Hamiota** |
| Traverse, Henry | Jackhead Fisheries | Arborg |
| **Unrau, Martin** | **Manitoba Cattle Producers Association** | **Portage** |
| Vaag, Rick | Private | Whitemouth |

| Presenter | Affiliation | Location of presentations |
|---|---|---|
| Van Aert, John | Private | Whitemouth |
| Van Slyke, Victor | ATD Waste Systems Inc. | Winnipeg |
| Vielfaure, Denis | Hytek | Friedensfeld |
| Vis, Peter | Precision Feed and Envirotech System | Stonewall |
| Waldner, Johannes | Baker Colony Better Air Systems | Portage |
| Waldner, Mike | Cool Spring Colony | Brandon |
| Watson, Herb | Private | St. Claude |
| Whitaker, John | Private | Dauphin |
| White, Gordon | Private | Brandon |
| Wiebe, Art | HogWatch Manitoba | Brandon |
| Wipf, Joe | Broad Valley Colony | Arborg |
| Wipf, George | Souris River Colony | Virden |
| Wishart, Ian | Private | Portage |
| Wolhgemuth, Victor | Private | Whitemouth |
| Wruck, Gus, | RM of Lac du Bonnet | Whitemouth |
| Young, David | Whitemouth Soil and Water Association | Whitemouth |

## Presenters of written submissions

| Presenter | Affiliation |
|---|---|
| Barkely, Barbara | Private |
| Baumel, Syd | Private |
| Bergmann, Rick, | Private |
| Brethour, Ed | Private |
| Carter, Nick | Private |
| Egert, Emil | RM of Cornwallis |
| Fefchak, John | Private |
| Gefreiter, Margaret | Private |
| Harrison, Bill | Private |
| Hartle, Katie | Private |
| Hedman, David | Private |
| Henderson, Chris | Southern Chiefs' Organization Inc. |
| Horbaty, Fred | Private |
| The Isenschmids | Private |
| Kavalench, Donald | Private |
| Kennedy Courcelles, Cheryl | Private |
| Keys, Shirley | Private |
| King, Catherine | Private |

| Presenter | Affiliation |
|---|---|
| Kornelson, Dennis | Animal Nutrition Association of Canada |
| Koroluk, Glen | Beyond Factory Farming Coalition |
| Kostiniuk Family | Private |
| Kowalke, Kaela | Private |
| Lennon, Marcel | Private |
| Leschyshyn, Joe | Private |
| Lowe, Erica | Private |
| Mailman, Mariah | Private |
| Marykuca, Peter | Private |
| Massey, Bill and Dorothy | Private |
| McPherson, Dan | Brandon and Area Planning District |
| Medro, Dana | Private |
| Mercier, Stephanie | Private |
| Trevan, Michael | Dean Agriculture, University of Manitoba |
| Miller, Kevin | Private |
| Newton, Scott | Private |
| Nichol, Jim and Colleen | Private |
| Novek, Joel | Private |
| Olfert, Milt | Private |
| Organic Plant Worker Co-op | |
| Picardie Farms | |
| Piniuta, Marilyn | Private |
| Powell, Larry | Private |
| Public Interest Law Centre, | |
| Rosolowski, Henry | Private |
| Saxton, Stan | Private |
| Stozek, Troy | Private |
| Suggett, Glen | Private |
| Tetrault, Ray | Private |
| Trafford, Denise | Private |
| Vanbenlan, Lance | Private |
| Waldner, Mike | Cool Springs Colony |
| Wiebe, Dave | Private |